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U.S. DEPARTMENT OF AGRICULTURE

1956 **CATALOG** 1957

GRADUATE SCHOOL

U. S. DEPARTMENT OF AGRICULTURE

WASHINGTON, D. C.

GRADUATE
UNDERGRADUATE
AND
NON-ACADEMIC
COURSES

Calendar for 1956-57

FALL SEMESTER

Sept. 15–22	Registration (Late fee charged after Sept. 22)
Sept. 24–28	Classes begin
Oct. 5	Last day of registration for credit
	Last day of course transfer without late fee
Oct. 19	Deferred payments due
Nov. 2	Deadline for credit-audit change
Nov. 12	Veterans Day—no classes
Nov. 29	Thanksgiving Day—no classes
Dec. 22–Jan. 4	Christmas holidays—no classes
Jan. 7	Classes resume
Jan. 25	Close of fall semester *

SPRING SEMESTER

Feb. 2–9	Registration (Late fee charged after Feb. 9)
Feb. 11–15	Classes begin
Feb. 21	Last day of registration for credit
	Last day of course transfer without late fee
Feb. 22	Washington's Birthday—no classes
Mar. 8	Deferred payments due
Mar. 22	Deadline for credit-audit change
May 30	Memorial Day—no classes
May 31	Close of spring semester *

SUMMER SESSION

June 3–8	Registration (Late fee charged after June 8)
June 10–14	Classes begin
June 14	Last day of registration for credit
	Last day of course transfer without late fee
June 21	Deferred payments due
July 4	Independence Day—no classes
July 12	Deadline for credit-audit change
August 16	Close of Summer Session *

* Classes which have missed sessions for any reason will continue until the deficiency is made up.

IMPORTANT

The provisions of this publication are not to be regarded as an irrevocable contract between the student and the United States Department of Agriculture Graduate School. The Graduate School reserves the right to change any provision or requirement at any time. The Graduate School further reserves the right at any time, to ask a student to withdraw when it considers such action to be in the best interests of the School.

GRADUATE SCHOOL

UNITED STATES DEPARTMENT OF AGRICULTURE

CATALOG

FALL — SPRING — SUMMER

1956 – 1957

Please keep this catalog for use in the Spring and Summer

This Catalog, published annually by the Graduate School, covers graduate and undergraduate programs for the Fall and Spring Semesters and the Summer Session. It is made as accurate as possible, but the right is reserved to make changes in details as circumstances require. A bulletin on correspondence study is available on request.

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General Information

Purpose of the School

Since its establishment in 1921, the objective of the Department of Agriculture Graduate School has been to improve the Federal Service by providing needed educational opportunities for Federal employees. The Graduate School now offers a resident evening program in Washington and a small correspondence program. In addition, it presents lecture series, offers educational counseling, contributes to training programs in the Department of Agriculture, and participates in cooperative programs with land-grant and other educational institutions. Graduate study is the primary interest of the School but it also offers an undergraduate program. Graduate School classes are open to all qualified employees of the Federal Government and to other qualified persons as facilities permit.

Founding of the School

The statute which established the Department of Agriculture in 1862 gave it the responsibility to "disseminate agricultural information in the broadest sense of the word." Thus from the beginning employees of the Department have been educators, and it soon became apparent that if they were to be successful they needed opportunities to continue their training while employed.

In 1898, Secretary of Agriculture Wilson expressed the need of the Department for an organization like the Graduate School, particularly to provide post-entry education for young scientists coming into the Department's research programs. No action, however, was taken at that time. Shortly after World War I, when the need for qualified personnel became acute throughout the government, the Congressional Joint Committee on the Reclassification of Salaries recommended that the government departments give more attention to the development of opportunities within the Federal Service for the continuing education of their employees. Accordingly, the Secretary of Agriculture appointed in 1920 a special committee to explore the matter. After considering the committee's findings and consulting leading educational institutions and other government agencies, the Secretary established the Graduate School in 1921 and announced at that time: "I believe those who may be able to avail themselves of this opportunity will both enrich themselves and enhance the value of the service they render."

Accredited Standing

The Graduate School does not grant degrees and has never sought that authority. It prefers to give courses of standard graduate and undergraduate grade; to have the merits of these courses judged by the well-known competence of its instructors; and to cooperate with institutions which have the authority to grant degrees.

The United States Civil Service Commission accepts Graduate School credits, for examination and qualification purposes, on the same basis as those from accredited colleges and universities.

Administration

The government of the Graduate School is vested in a General Administration Board appointed by the Secretary of Agriculture. The functions of this Board correspond in general to those of boards of trustees of universities. The School is administered by a director and a small administrative staff. It is a nonprofit institution and receives no Federal funds.

The evening program in Washington is organized into eight departments. Each department is directed by a departmental committee composed of an appointed chairman and others of recognized competence in the respective fields. These committees are responsible for organizing and giving general administrative direction to the programs and activities of the departments. Within the departments, depending on the scope and specialization of the programs are divisional committees. The eight department chairmen and the Director make up the Graduate School Council. Similar committees direct other Graduate School programs.

Teaching and Research Resources

The Graduate School recruits its staff from scholars in the Federal Service. Many of the faculty members, in addition to government service, have taught in the colleges and universities throughout the country.

The Graduate School student body enjoys the use of the noted library and laboratory facilities of Washington. In addition to a large library in the Department of Agriculture, containing more than a million volumes on both agricultural and non-agricultural subjects, students have ready access to the rich storehouses of the Library of Congress, the Smithsonian Institution, and the National Archives. Supplementing the Department Library as necessary is a collection of books supplied directly by the Graduate School.

Public Lectures and Seminars

Public lecture series give Department employees and others an opportunity to hear authorities discuss current problems in agriculture and in other national and world affairs. Lectures which are especially relevant to the needs and interests of Department employees are given during official working hours. Registration is not required and no fees are charged.

Programs for Federal Employees Outside of Washington

In order to increase educational opportunities for the field employees of the Federal government, the Graduate School has cooperated with universities in various metropolitan centers in the organization of programs of evening courses. At the present time, programs of courses designed especially to meet the needs of Federal employees are being offered by Boston University, New York University, and Temple University.

Cooperative Internship Program with Land-Grant Institutions

Post-graduate and post-doctorate personnel in Land-Grant Colleges and Universities are afforded opportunities for research and for gaining other desirable experience under this program developed jointly by a committee from the Graduate Council of the Association of Land-Grant Colleges and Universities and the Graduate School. This work is under the direction of the Department of Agriculture professional staff in Washington, the Agricultural Research Center and elsewhere. Specific arrangements under this program are between personnel from these educational institutions and agencies in the Department. Details may be had from the Office of Personnel or the Graduate School.

Certified Statements of Accomplishment

Certified Statements of Accomplishment are offered in the fields of Accounting, Administrative Procedures, Editorial Practices, Meteorology, Oceanography, Public Administration, Statistics, and Surveying and Mapping upon the student's completion of specified programs of study. Each student interested in earning a Certified Statement of Accomplishment in any of these fields should receive approval, from the Registrar, of his proposed program of study. For complete details see the outlined program in the Department concerned.

These statements are offered to encourage the student to complete a well-organized program in his chosen field of study or work.

Each student who receives a certified statement also is given an informational transcript of his completed program which he may use as a public record of qualification. At the student's request, an official transcript is sent to an institution or agency designated by him.

Graduate School Publications

Publications of the Graduate School include:

1. A general annual *Catalog* which contains detailed information about the resident educational program in Washington, D. C.
2. Time Schedule and Supplement, published each semester—fall, spring and summer—which carries added details about the resident educational program in Washington.
3. Books and periodicals, published at irregular intervals containing: original contributions by faculty members; special lectures devoted to the advancement of the arts and sciences; and significant manuscripts prepared by employees of the Department of Agriculture, which the Department has been unable to publish. A partial list of these publications is given on the outside back cover of this *Catalog*.

Correspondence Program

The small correspondence program of the Graduate School is designed primarily for the field employees of the Department of Agriculture, although the courses are open to others as the facilities permit. There are many other courses not offered by the Graduate School which are of interest to Department employees and are available through the correspondence programs of the colleges and universities throughout the country. The Graduate School is happy to assist a student to find courses in which he is interested.

The courses offered by the Graduate School are listed on page 108 of this *Catalog*. Students who wish more information about any of the courses or who wish to register in one of the courses may write to the Registrar, U. S. Department of Agriculture Graduate School, Washington 25, D. C.

Regulations and Procedures

Admission

Admission to resident courses in the Graduate School is open to all qualified employees of the Federal Government, and to other qualified persons as facilities permit.

Entrance Requirements

Since the Graduate School does not offer degree programs, entrance requirements differ with the level of the course for which the student is registering.

Undergraduate courses, in general, are open to persons who are graduates of a standard high school or equivalent or who qualify for the course because of satisfactory work experience. For admission to more advanced courses college work in the same or related field is specified or understood. For other courses definite prerequisites may be stated. Year courses require the completion of the work of the first semester or its equivalent.

Veterans

Graduate School resident courses are available to veterans under the provisions of Public Law 550. Registration for part-time study is charged against educational benefits only in the proportion that the number of semester hours bears to a full normal load.

Veterans who are re-entering Graduate School classes after an interruption of training or who are entering the Graduate School for the first time are advised to consult the Registrar of the Graduate School sufficiently in advance of registration that a program may be determined and the necessary arrangements made with the Veterans Administration.

Scholarships

Each semester the Graduate School grants scholarships, in the form of free tuition for one course, to persons who are principal participants in the interdepartmental management intern programs operated by the Civil Service Commission. In addition, a limited number of similar scholarships are available each semester to worthy and qualified Federal and District Government employees. Individual applications for such scholarships should be made to the Graduate School at least one month prior to the beginning of registration for the semester in which the scholarship is desired.

Counseling Services

Officers of the Graduate School are available, throughout the registration periods and from 9:00 a.m. to 5:00 p.m. each day for counseling on educational plans, whether courses are to be pursued in the Graduate School or in other institutions. In addition, where necessary, arrangements are made to refer persons having special problems to authorities in the particular field of work or study.

Transfer of Credit

Careful planning is important for any prospective student, but particularly so for the Federal employee who wishes to make a substantial beginning in his educational program through the Graduate School, where degrees are not granted and credits must eventually be transferred to a degree-conferring institution. A student cannot assume that credit for work done at the Graduate School will be accepted by any particular college or university. Universities generally accept transfers of credit on the basis of the individual courses taken, the student's over-all program, and the quality of the work done by the student.

The student who wishes to take an advanced degree should consult *in advance* the dean of the graduate school of the institution where he expects to become a candidate for his degree to secure approval for whatever portion of his program the institution of his choice will accept from the Graduate School. The student who is deficient in basic undergraduate courses needed as a foundation for his graduate program will find many of them available in the large undergraduate program of the Graduate School. Others may be found in local universities.

A student who is planning work toward an undergraduate degree should consult *in advance* the dean of the institution from which he expects to receive the degree if he wishes credit toward the degree for work taken at the Graduate School.

Registration

The registration period for each semester is shown on the School calendar on the inside front cover. A late fee per course is charged for registration after the opening of the semester. After the second week of classes in the fall and spring semesters, and after the first week in the summer session, students may register for credit only with the approval of the instructor and the Registrar. Registration is not completed until the required fees have been paid.

Course Load

Students employed full time may carry more than two courses only with the permission of the Registrar.

Fees

Course Fees. In general, fees are computed at $12.00 per semester hour credit.

Late Fees. There is a $2.00 per course late registration fee and a $1.00 per course late transfer fee as shown in the School Calendar.

Reinstatement Fee. Students who fail to meet payments when due are charged a reinstatement fee of $2.00 per course in addition to all accrued fees.

Laboratory Fee. Laboratory or materials fees are listed in the Schedule of Classes for each semester, in connection with the courses for which they are charged.

Service Fee. A fee of $1.00 per course is charged each student using the deferred payment plan.

Transcript Fee. There is a 50¢ fee for each copy of a student's record on the regular Graduate School form or on the form of another institution or state board of education.

Payment of Fees

Fees are due and payable in advance at the time of registration. Registration is not complete and no student is permitted to attend classes until all fees have been paid.

An arrangement may be made at the time of registration for payment of fees in two installments, one half plus a service fee at the time of registration, and the balance by the end of the fourth week in the fall and spring semesters, and by the end of the second week in the summer session.

A student who fails to meet payments when due will be suspended and may not attend classes until he has been reinstated and has paid all accrued fees as well as a reinstatement fee of $2.00 per course.

All fees are payable at the Graduate School business office, Room 1031, South Building, United States Department of Agriculture.

Attendance at Classes

Students are expected to attend all class sessions and not to absent themselves without adequate reason.

Absences do not relieve the student from responsibility for work required while he was absent, and the burden of proof that the

work was done rests with the student. In courses in which the work cannot be satisfactorily tested by written examination, the instructor shall be the judge of the relation of the student's attendance or non-attendance to his grade. A student registered for credit who is absent more than 25% of the class periods receives a mark of "W," withdrawn, unless he makes up all required work. Auditors who are absent more than 25% of the class periods receive the mark of "W."

Credit and Grades

Academic Credit. Persons registering for academic credit must satisfy all prerequisites for admission to the course as generally stated or specified in the course description.

Audit. An auditor must meet the same prerequisites as a credit student. He receives full privileges of class participation if he chooses to exercise them. An auditor does not receive a grade; he receives only a mark of AUD.

Change from Audit to Credit. A student may change his registration from audit to credit, or vice versa, within thirty days after the beginning of the semester in the fall and spring, and within three weeks after the beginning of the summer session. The request for change must be made in writing to the Graduate School. Special forms are available at the School office.

Grades. At the close of the semester students receive written notice by mail of grades received. The following letter grades are used:

A	Excellent
B	Good
C	Fair
D	Passable
F	Failure
Aud	Auditor
Inc	Incomplete
W	Withdrawn

Transcript of Credit

Inclusion in Personnel Record for Department of Agriculture Employees. To aid in effecting its promotion-from-within policy, the Department has provided (USDA Administrative Regulations, Title 8, Chapter 42, paragraphs 1548–1551, dated 10–13–48) that a record of Graduate School credits earned by its employees will be placed in official personnel files of the agency. Unless specifically requested by the employee that such action not be taken, the Graduate School will forward, upon completion of the courses or at the

end of the year, a copy of the student's record, without cost to the employee, to the personnel officer of the unit of the Department of Agriculture in which the student is employed.

Transcripts for Employees of Other Agencies. Students who are not Department of Agriculture employees may obtain a transcript for their personnel files or for other purposes by requesting it in writing to the Graduate School with the payment of the transcript fee of fifty cents.

Withdrawal and Refunds

Application for withdrawal from Graduate School classes must be made in writing to the Registrar. A form for this purpose is available in the Graduate School Office. *Reporting the dropping of a course to an instructor does not constitute an official withdrawal.* Permission to withdraw will not be given to a student who does not have a clear financial record.

Refund of tuition fees only will be granted in cases of official withdrawal according to the following schedule:

Fall and Spring Semesters	*Refund*
During first and second weeks of term	Tuition less $5.00 per course registration fee.
During third and fourth weeks of term	60% of tuition (a minimum of $5.00 per course will not be refunded).
During fifth and sixth weeks of term	50% of tuition.
Summer Session	
During first week of session	Tuition less $5.00 per course registration fee.
During second week of session	60% of tuition (a minimum of $5.00 per course will not be refunded).
During third week of session	50% of tuition.

Refunds will be computed as of the date the application for withdrawal is received in the Graduate School Office. In no case will tuition be reduced or refunded because of non-attendance in classes. No refund will be made of laboratory or other incidental fees.

Since commitments for instruction and other arrangements are necessarily made in the beginning of the semester, no refunds for any reason can be made except in accordance with the above schedule.

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The Graduate School reserves the right to cancel any course if registration does not warrant continuance; to discontinue, postpone or combine classes; to change instructors; to change classroom assignments; to make any changes deemed advisable in registration and in fees; and to require the withdrawal of any student at any time for such reasons as the School deems sufficient.

Courses of Instruction

Courses offered during the academic year 1956–57 are listed on the following pages by departments of instruction. The departments are listed alphabetically.

The words Fall, Spring and Summer indicate the semester in which the course is offered. The number of credits indicates the value of the course in semester hours. Bracketed numbers indicate courses which will not be offered in 1956–57.

Courses numbered 1–100 are non-credit; 100–399, undergraduate; 400–699, advanced undergraduate (senior) and graduate; above 699, graduate only.

Biological Sciences

DEPARTMENTAL COMMITTEE

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Lawrence V. Compton
Geoffrey Edsall
N. R. Ellis
Ralph E. Hodgson (Vice-chairman)
Edward F. Knipling
Daniel L. Leedy
Karl S. Quisenberry
Byron Olson
DeWitt Stetten

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Scientific efforts have been greatly intensified in recent years with the result that research discoveries have a direct bearing on the activities of every individual and organization. Many government workers in fields only indirectly related to biology often need an understanding of basic principles in the biological sciences to do a competent job in their own fields. On the other hand, government workers in the biological sciences are continually faced with the problem of keeping abreast of the rapid advances in the application of these principles and new gains in basic knowledge.

The Department of Biological Sciences has arranged a series of courses to meet the needs of each of these groups. Unless laboratory work is specified, the courses are non-laboratory. The advanced courses are taught as seminars. All of the courses are taught by outstanding specialists from Federal and other research institutions.

In addition to the courses listed below, the Graduate School offers several courses in the biological sciences at the National Institutes of Health in Bethesda. These courses may be found on page 100 of this catalog.

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1-126. Disease Classification and Medical Terminology

Fall, 2 credits — Louise Bollo

Designed for medical secretaries, librarians, diagnosis coders, social workers, statisticians, and other workers in various health programs. Sources and meanings of the hundreds of disease entities encountered in hospital records, death certificates, causes of disability, etc. and the basic principles of disease classification. Helpful to persons who are interested in the tabulation and measurement of disease but who have not had a formal medical education. *Prerequisite:* Some college training or experience in health work is helpful but not essential.

1-300. Fundamentals of Entomology

Spring, 3 credits (alternate years) REECE I. SAILER

An introductory course designed to provide the student with the basic elements of entomology. Recognition of the principal orders of insects and their important families is stressed. A study of the terminology and identification with the anatomical structure of insects. Attention is given to the biology of insects and to their phylogenetic and ecological relationships to other organisms. Lectures, discussion, laboratory and Saturday morning field trips. *Prerequisite:* Basic training in biology or consent of instructor.

1-570. Design of Experiments in Biological Sciences

Year, 2 credits each semester E. JAMES KOCH

A course in the principles of planning and analyzing animal and plant experiments. The basic design principles of completely randomized, randomized block, Latin Square, factorials, confounding, split plot, lattices, incomplete blocks and other designs are fully discussed and illustrated with student problems. The principles and application of correlation, regression, covariance, multiple regression, experimental and sampling errors, components of variance, missing data, mean separation, individual degrees of freedom, size of plot, and size of experiment to experimental design are studied. Problems of special interest to the students are considered. This class meets at the Plant Industry Station, College Park, Maryland. *Prerequisite:* A course in experimental statistics, general familiarity with standard error, analysis of variance, regression, correlation, chi-square, t tests, and F tests, or experience in applying the principles of statistics to experimental data.

[1-603.] Advances in Plant Breeding and Genetics (1957–58 and every third year)

Fall, 2 credits MARTIN G. WEISS and SPECIALISTS

Methods of breeding naturally self- and cross-pollinated plants, theories of early generation testing, nature and use of heterosis in plant breeding, techniques of self-pollination and hybridization, and plant improvement through interspecific hybridization and polyploidy. *Prerequisite:* Basic knowledge of genetics and plant breeding.

1-635. Bacteriological Instrumentation

Fall, 2 credits HERMAN C. ELLINGHAUSEN

Construction, theory, and application of various instruments and special techniques used in bacterial metabolism with a limited amount of practical demonstration. Subjects to be covered: Colorimetry, nephelometry, spectrophotometry, infra-red techniques in bacteriology, cell free extract methods, Thunberg method, Warburg technique, pH, and various miscellaneous methods such as acid base chemistry, microbiological assay, analysis for carbohydrates and nucleic acids, techniques of immunochemistry, and chromatographic analysis. This class meets at the Agricultural Research Center, Beltsville, Maryland. *Prerequisites:* 1-628, Advanced Bacteriology—Bacterial Metabolism, or equivalent. Desirable background courses: biochemistry and quantitative analysis.

1-702. Radioisotopes and High Energy Radiation in Biology

Spring, 2 credits (every third year)
STERLING B. HENDRICKS and MERRILL E. JEFFERSON

Principles involved in the production and measurement of high energy radiation and radioisotopes will be discussed as a background for application to biology. Applications will deal with the effects of radiation on living sys-

tems, and use of isotopic tracers in study of biochemical mechanism and plant nutrition. Guest lecturers will discuss special topics. *Prerequisite:* Professional training in biology, chemistry or physics.

Special Program in Plant Quarantine Studies

The following courses form a special in-service training program in plant quarantine studies, and are given in New York City with the cooperation of the Plant Quarantine Branch, Agricultural Research Service. The program is under the general direction of Milton H. Sartor, Training Officer, Division of Foreign Plant Quarantines, Plant Quarantine Branch, Agricultural Research Service.

1-515. Plant Quarantine Entomology

Schedule to be arranged, 6 credits — Ira A. Lane

A concentrated, technical course in entomology especially designed to fill a need on the recognition to family of immature forms frequently encountered in plant quarantine work; to familiarize the participant with insect pests, the hosts, distribution and avenues of entry to notoriously dangerous forms not known to be established or widely distributed in the United States.

1-535. Basic Training for Plant Quarantine Inspectors

Schedule to be arranged, 10 credits — Ira A. Lane, Walter S. Fields, Maynard J. Ramsay, and William Friedman

A consecutive 26-week program for new Federal plant quarantine inspectors designed to orient the new employee in the Department of Agriculture, its organization, function and basic personnel policies; basic legislation and other legal authorities affecting plant quarantine operations; principles of plant quarantine enforcement; Federal-State relationships; inspection and treatment techniques and procedures; technical aspects of foreign pest evaluation; identification and distribution in the fields of entomology, plant pathology, and nematology as applicable to foreign plant quarantine enforcement; commodity recognition as applicable to plant materials moving in international commerce.

1-615. Plant Quarantine Pathology

Schedule to be arranged, 4 credits — Walter S. Fields and Charles S. Tuthill

A specially designed program for regulatory officials interested in quarantine phytopathology. Emphasis is placed on detection, recognition, and nomenclature of disease-causing organisms frequently encountered in plant quarantine operations, particularly those not known to occur or be widely distributed in the United States.

1-708. Plant Quarantine and Plant Protection

Schedule to be arranged, 10 credits — Ira A. Lane

A special course arranged for foreign trainees who are studying plant quarantine methods in the United States. Course includes study of the interrelationships of agencies of the U. S. Department of Agriculture, regulatory and control organization and policy, basic quarantine legislation, fundamental principles affecting promulgation of quarantines and restrictive orders. Field observations and participation in operational activities of the Plant Quarantine Branch at ports of entry. Review and observation of field control projects and quarantine operations in the Northeast, Southeast, and Southwest Regions.

Languages and Literature

DEPARTMENTAL COMMITTEE

J. KENDALL MCCLARREN (Chairman)

J. P. BLICKENSDERFER — KENNETH W. OLSON
ERWIN JAFFE — LESTER A. SCHLUP
FOSTER E. MOHRHARDT — FRANKLIN THACKREY (Vice-chairman)
R. LYLE WEBSTER

IMPORTANCE OF ENGLISH, WRITING AND SPEECH

Among students preparing for technical careers and among busy people employed on the basis of their technical competence, there is an inevitable tendency to concentrate on subject-matter specialties. Technical knowledge is of no value, however, unless it can be communicated to others. It is common knowledge in the Government service and in industry that nothing so much retards the progress of many young technicians, scientists, and other professional personnel as their inability to write and speak effectively.

CERTIFICATE OF ACCOMPLISHMENT IN EDITORIAL PRACTICES

Certified Statements of Accomplishment in Editorial Practices are granted to students who have completed an organized course of study intended to provide basic training for responsible editorial and publications work. The program leading to this certificate should be of special interest to persons who wish to enter editorial work and to those now employed in editorial or publications work who wish to prepare themselves for job advancement.

Persons who wish to enter the profession should have a good, general educational background. It is recommended that students who wish to work toward the certificate have at least two years of college work, preferably a college degree, or work experience in a subject matter field.

Requirements

Students seeking this certificate should consult with the Registrar and obtain approval of their proposed course of study early in their academic program. Equivalent courses will be accepted by transfer from other institutions.

1. A demonstrated facility in English grammar and composition. This requirement may be met by successful completion of an examination to be given as a part of the course, Principles of Editing.

2. Twenty-four semester hours of credit with an average grade of "B" or better in the following courses:

   a. *Required courses:* (14 credits)

      Principles of Editing (3)
      Advanced Practice in Editing (3)
      Printing Procedure and Layout Design (2)
      Editing Technical Manuscripts (2)
      Preparation of Publications for Mass Audience (2)
      Problems in Editing (2)

   b. *Editing Electives:* (6 credits selected from the following)

      Introduction to Official Writing
      Workshop in Official Writing
      Readable Writing
      Technical Writing
      Basic Reference Service and Reference Tools
      Introduction to Bibliographic Science
      Indexing
      Graphic Methods of Presenting Statistics
      Feature Writing

   c. *Subject Matter Electives:* Four hours credit in subject matter courses as recommended by the student's employer or as selected by the student. May be selected from the Editing Electives listed above if those are appropriate to the position for which the student is preparing. The four hours may be waived by the Graduate School departmental committee for students who have college work or acceptable experience in the subject matter field.

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ENGLISH—GRAMMAR AND WRITING

2-35. English for Secretaries—Rapid Review

Summer, non-credit JAMES O. HARMON

Sentence structure, capitalization, punctuation, vocabulary, and spelling.

2-95. Improving Reading Ability

Fall, non-credit. Repeated in Spring and Summer CARL MURR

A course to improve individual reading skills and techniques. Students are given training to increase their reading rate without loss in comprehension. Tachistoscope and silent reading films are used for group training with additional time for individual training with the reading accelerator. Course also includes ophthalmograph and telebinocular tests to determine eye movements and visual acuity.

2-112. Practical English Usage

Fall, 2 credits. Repeated in Spring and Summer

CHARLOTTE MANGOLD
DOROTHY PAUL
VERNE L. SAMSON

This course enables students through practice to master the fundamentals of correct English. Troublesome problems of English usage, sentence structure, choice of words, style, and grammar, are studied as aids to clear and forceful writing of letters, memoranda, and reports.

2-119. Vocabulary Building

Fall, 2 credits. Repeated in Spring and Summer

CHARLES D. MURPHY

Study of the sources and origins of words in order to gain insight into their present meanings. Principles of word formation; dictionary study and exercises in word selection. The course stresses the most common Latin and Greek roots used in forming English words.

2-222. English Composition

Year, 3 credits each semester

KATHRYN P. WARD
KAY B. WEBER

Equivalent of freshman English. An introductory course in writing and English usage, designed especially for those who need a course preparatory to more advanced English studies. Special attention given to the fundamental principles and mechanics of good writing—grammar, punctuation, spelling, diction, etc. Exercises in writing short and long themes and in studying, analyzing, and evaluating selected English prose texts.

2-223. Descriptive English Grammar

Year, 2 credits each semester

SUSAN E. HARMAN

A course in the study of grammatical principles, stressing sentence structure and correct English form. Lectures on the history and development of inflectional and derivational forms. Exercises in diagramming and in analyzing examples of good and bad English.

2-224. Readable Writing

Fall, 2 credits

AMY G. COWING

Teaches you how to write so that more people will read and understand your articles and bulletins; how to estimate how easy or hard the reader will find your writing; how to organize your writing for easy reading. Deals briefly with the use of pictures and other visual aids to reading. Much of the course centers around use of the Flesch Readability Formula and consists of lectures and workshop sessions in which students make practical application of writing principles.

2-226. Introduction to Official Writing

Fall, 2 credits. Repeated in Spring

J. KENDALL MCCLARREN
THOMAS F. MCGINTY
WILBERT SCHAAL

This course covers the principles of clear statement which must be applied to all forms of writing. Emphasis is given to the special requirements of official writing in economic and scientific research, government organization, and policy. The course considers ways of making official writing clear, vigorous, and readable in spite of the necessary rules and restrictions. It is designed for people who are not professional writers but whose work calls for some copy preparation or report writing. One major writing project is required. *Prerequisite:* College freshman English or the equivalent in writing experience.

2-227. Workshop in Official Writing

Spring, 2 credits (alternate years) J. KENDALL MCCLARREN

This course is a continuation of Introduction to Official Writing. The informal workshop approach is designed to meet the individual needs of students whose work requires some writing. Writing principles developed in the previous course are applied to reports, scripts, releases, and other media. *Prerequisite:* Introduction to Official Writing or its equivalent.

2-230. Sentence Revision

Spring, 2 credits VERNE L. SAMSON

Designed for students who wish to improve their writing. Review of the grammatical elements of the sentence, a study of established patterns of sentence construction, and constant practice in rewriting sentences. *Prerequisite:* Completion of Practical English Usage, Descriptive English Grammar, or the consent of the instructor.

2-235. Fiction Writing

Fall, 2 credits. Repeated in Spring PHILIP M. ROTH
H. RICHARD SHEA, JR.

Stresses such fiction fundamentals as plotting, characterization, dialogue, story organization, testing readability and interest, and increasing dramatic quality of writing. Emphasizes writing techniques which increase salability of student manuscripts by discussing editorial taboos, ways to obtain salable story ideas, and methods of marketing manuscripts.

2-242. Fiction Writing Workshop

Spring, 2 credits OLGA MOORE ARNOLD

Discussion, criticism and suggestions for revising student manuscripts. Emphasizes methods of slanting for particular markets, discussions of what editors buy and why, and ways to polish manuscripts to increase sales possibilities. *Prerequisite:* Fiction Writing or equivalent.

2-280. Feature Writing

Fall, 2 credits DUNCAN N. SCOTT

Stresses how to find article ideas, how to do the research necessary to develop them into salable articles, best methods of presentation of material, ways to polish writing to make it more salable, ways to determine magazine needs, how to slant material for particular magazines, and how to test readability and interest of writing.

2-281. Feature Writing Workshop

Spring, 2 credits DUNCAN N. SCOTT

Discussion, criticism and suggestions for revising student manuscripts. Emphasizes methods of slanting for particular markets, discussions of what editors buy and why, and ways to polish manuscripts to increase sales possibilities. *Prerequisite:* Feature Writing or equivalent.

2-450 Technical Writing

Fall, 2 credits MARGUERITE GILSTRAP and MAURICE FRIED

A course designed to help scientists and economists improve their research reports and articles for professional publications. The first 3 weeks are devoted to a survey of the fundamentals of writing the technical report: its characteristics, parts, functions, the steps in preparation, the process of criticism. The

remainder of the term is spent in the preparation, criticism, and revisions of reports and articles—written for official use when possible. *Prerequisite:* Undergraduate degree in one of the sciences, engineering, economics, or similar technical field.

4-330. Government Letter Writing (See p. 45)

4-421. Writing Procedures and Instructions (See p. 45)

Literature

2-330. Great Books

Year, 2 credits each semester * M. Clare Ruppert

Group discussion, under leadership, of important works in poetry, history, philosophy and criticism. The leader will try to help with the reading and understanding, but the books themselves will be the teachers. The intention of the course is to give insight into perennial, and therefore contemporary, problems, not historical and literary information. The only qualifications required are an interest in ideas and belief in free discussion. With few exceptions the books will be read in their entirety. One, two, or three meetings will be given to a book depending upon its length. Discussion will center around the following authors:

Reading List A (1956–57 and alternate years)

Fall Semester: Bible, *Ecclesiastes;* Homer, *Iliad;* Aeschylus, *Oresteia;* Sophocles, *Oedipus at Colonus;* Plato, *Symposium* and *Republic,* Bk. VI–VII; Aristotle, *Ethics;* Thucydides, *History of the Peloponnesian War;* Epictetus, *Discourses* (Selections); Lucretius, *On the Nature of Things.*

Spring Semester: Bible, *Gospel According to St. Matthew;* Shakespeare, *Macbeth;* Milton, *Areopagitica;* Adam Smith, *Wealth of Nations;* Descartes, *Discourse on Method;* Swift, *Gulliver's Travels;* de Tocqueville, *Democracy in America;* Thoreau, *Civil Disobedience;* Kant, *Perpetual Peace;* Mill, *On Liberty;* Twain, *Huckleberry Finn.*

Reading List B (1957–58 and alternate years)

Fall Semester: *Declaration of Independence;* Bible, *Book of Job;* Homer, *Odyssey;* Sophocles, *Antigone* and *Oedipus Rex;* Plutarch, *Lives: Alexander and Caesar;* Plato, *Apology* and *Crito;* Aristotle, *Politics,* Bk. I; Marcus Aurelius, *Meditations;* St. Augustine, *Confessions;* St. Thomas Aquinas, *On the Law.*

Spring Semester: Dante, *Divine Comedy;* Machiavelli, *The Prince;* Shakespeare, *Hamlet* and *King Lear;* Hobbes, *Leviathan;* Rousseau, *Social Contract;* Locke, *Civil Government; Federalist Papers;* Marx, *Communist Manifesto.*

* Students may attend both semesters or either semester.

Information Methods

2-220. Indexing

Fall, 2 credits Maude K. Swingle

This course is intended primarily for those interested in making indexes for periodicals, bulletins, reports, and books. Emphasis will be placed on general procedures and matters of policy as well as on basic principles and techniques.

Specific types of indexing adapted to various subjects and popular style, contrasted with technical and scientific styles, will be studied. Examples of different kinds of indexes will be shown and opportunity given for practical work in the preparation of indexes, including the making of cross references, alphabetizing, and editorial preparation of index cards and manuscripts for the printer. *Prerequisite:* A knowledge of library or editorial work is desirable.

2-225. Principles of Editing and Their Application

Fall, 3 credits — F. L. Ehrhardt and Catherine F. George

Intended primarily as a survey course for those seeking information on editorial techniques involved in handling manuscripts after they leave the author's hands and until they are issued in printed form. Discussion of the fundamental principles of editing, including the organization or rearrangement of material for effective presentation; rhetorical style in relation to subject matter; word forms, sentence structure and effective use of English; the Style Manual of the Government Printing Office; considerations governing titles, tables of contents, headings, footnotes, illustrations, literature citations and bibliographies, and statistical checking; the principles of table formation and arrangement; the relation of type to subject matter and the techniques of printing; and the fundamentals of indexing and proofreading. Opportunity is afforded to apply these principles in practical work in editing, which is then discussed in class. A trip to the Government Printing Office is arranged to note and study operations there.

2-360. Advanced Practice in Editing

Spring, 3 credits — Geniana R. Edwards and Specialists

Advanced instruction in literary and statistical editing and handling of graphic materials. Students will edit a practice manuscript requiring reorganization, extensive editing, and uniform styling. Several Government agency styles for citation, tables, graphics, and other details will be compared, and adaptation of style meeting special requirements yet conforming to Government Printing Office rules will be studied. Administrative procedures for work on pamphlets, magazines, etc., will be outlined. *Prerequisite:* Principles of Editing and Their Application, or consent of instructor.

2-365. Editing Technical Manuscripts

Fall, 2 credits — Harold B. Simpson

The role of the editor, including the human relations aspects, the relative responsibilities of editor and author, and the ethical basis for editing. Editorial evaluation of technical manuscripts, including organization, general presentation, and functions of component parts; review and evaluation of technical reports edited by students. *Prerequisite:* Principles of Editing and Their Application, or consent of instructor.

2-237. Printing Procedure and Layout Design

Spring, 2 credits — Elmo J. White

Printing processes and printing media; composition; book binding; typography and design; printing types; illustrations, including photo-engraving process and photographs; printing design, rough layouts, finished layouts, methods of copy fitting; printing for the Government, including agency responsibility, GPO responsibility, and agency procedure for procuring printing; other printing media, including silk screen, ozalid, varitype, cold-type processes, and others; regulations and specifications of the Joint Committee on Printing, GPO paper catalog, Style Manual, printing and binding regulations.

The course is intended for those who plan, prepare, or procure printing, duplicating, and distribution of books, pamphlets, folders, posters, charts, forms, and other printed or duplicated matter.

2-415. Preparing Publications for a Mass Audience

Fall, 2 credits — Dennis S. Feldman

Between the final editing and the time a pamphlet, brochure, or booklet comes off the press lies a multitude of details designed to enhance the popular appeal of the publication. The picture editor who lends his talents to make a publication come alive; the artist and layout man who creates visual appeal; the caption writer—all these key personnel bring their specialized skills to bear. These fields are discussed through the use of practical, working demonstration and lectures. Techniques of preparing a manuscript for a mass audience are considered. Special emphasis is placed on the use of techniques which combine appeal with readability through extensive use of graphic material. Students may bring to class problems or materials on which they are currently working. *Prerequisite:* At least three of the Graduate School courses in editing, or the equivalent in training or experience.

2-430. Problems in Editing—Seminar

Fall, 2 credits — Jerome H. Perlmutter

Organization of material, readability, and relationships between editors, authors, artists, and administrators are considered. Emphasis is placed on students' current on-the-job editorial problems. Field trips to an editorial office and printing plant are arranged. *Prerequisite:* Completion of other required courses for Certificate in Editing, or consent of instructor.

2-065. U. S. Government Films and Film Services—Seminar

Fall, non-credit — Seerley Reid and R. Lyle Webster

Series of 10 lectures, with followup discussion, on methods and problems in the production, distribution, and use of motion pictures by Government agencies. Topics include historical review, legislative provisions, archival and reference services, overseas use of films, procurement methods and production procedures, film use in Government personnel and training programs (military and civilian), methods of distribution to the public, evaluation. Lecturers will be especially chosen for each topic.

Registration is required but no fees are charged.

Library Techniques

The following courses are designed as non-professional library courses, offering a background of information and training for the sub-professional library assistant and other persons whose work requires a knowledge of these techniques, such as teachers, research assistants, etc. Students may take the courses in any sequence.

2-135. Introduction to Cataloging and Classification

Spring, 2 credits — Instructor to be announced

The philosophy of organization of the materials of communication; typical rules for descriptive and subject cataloging; the coordinate index and other forms of indexing; the structure of systems of classification; the Library of Congress system of classification.

2-136. Principles of Library Organization

Spring, 2 credits — Joseph T. Popecki

The system and function of a library based on its component parts and services which obtain regardless of size or purpose; the organization of function and service for utmost efficiency.

2-137. Basic Reference Service and Reference Tools

Fall, 2 credits — Marion E. Bonniwell

The process of satisfying intellectual inquiry; sources of information; study and comparison of a basic list of 150 reference tools with the exception of general bibliography.

2-138. Introduction to Bibliographic Science

Fall, 2 credits — Joseph T. Popecki

Bibliographic science and bibliographic style for beginners; variations and forms of bibliography; study and comparison of the general bibliographic tools and indexes of chief importance.

2-145. Law Librarianship

Year, 2 credits each semester — Harry Bitner

A survey of source materials for the law library, and a study of library administrative procedures as applied to a law library. The first semester is concerned with source materials: primary authorities and secondary authorities, international law, government publications, and other materials. The second semester is concerned with law library service: organization and staffing, book selection, accessioning, cataloging, reference services, administrative records and reports. Students may take either or both semesters. *Prerequisite:* Training in law or library work, or equivalent experience.

Speech

2-228. Fundamentals of Speech

Fall, 2 credits. Repeated in Spring — Virginia B. Roser

Through the preparation and delivery of short original speeches the student gains poise, assurance, and the ability to express himself clearly and accurately. Strict adherence to time limit quickens mental processes and develops discrimination in the selection of speech material. Voice, articulation, and pronunciation drills. Posture, movement, and gesture. Learn to speak by speaking at each class meeting. Constructive criticism.

2-229. Public Speaking

Fall, 2 credits — George E. Beauchamp

Students enrolling for this course should have had Fundamentals of Speech or some speech-making experience. Emphasis is placed on determining what one's purpose is in speaking, and accomplishing that purpose effectively. How to be interesting and clear, how to develop and support ideas, and how to handle discussion. Each student speaks and receives personal speech suggestions at each class meeting.

2-232. Voice and Remedial Speech

Fall, 2 credits. Repeated in Spring — Stanley L. Berlinsky, Walter B. Emery

Study and intensive drills in voice production, flexibility, range, articulation, and enunciation. Training and practice are designed to improve vocal conditions for all speech purposes and to remedy minor speech difficulties. In order that students may receive more individual attention, registration is limited to twenty.

Foreign Languages

The Graduate School provides opportunities for instruction in a wide range of foreign languages. The person who is seeking the maximum practical value from a foreign language must learn not only to translate it but to think in it well enough for translation to be unnecessary. It is the aim of those responsible for these courses to conduct them so as to develop in their students a ready and intelligent use of the language.

French

2-68. Reading French—Grammar Review and Vocabulary Building

Fall, non-credit. Repeated in Spring and Summer — Marguerite Etienne

Basic French grammar, reading and vocabulary building for students who have had some French and wish to review it, and for beginners who wish an introduction to the language.

2-87. French for Travelers I

Fall, non-credit. Repeated in Spring and Summer — Germaine Bargin

Acquiring a facility in the use of oral French, including practical, every-day expressions helpful to those who plan a trip to France or to those who plan to work in a French-speaking country. For persons with or without previous study of the language.

2-97. French for Travelers II

Spring, non-credit. Repeated in Summer — Germaine Bergin

Continuation of French for Travelers I. May be taken also by students who have an elementary conversational ability and wish to improve.

2-253. Elementary French

Year, 3 credits each semester — Germaine Bargin, Marguerite Etienne

Provides basic knowledge of French grammar and vocabulary. Reading, translation, dictation, and some conversation. For beginners.

[2-254.] Intermediate French (1957–58 and alternate years)

Year, 3 credits each semester — Germaine Bargin

Systematic review of French grammar. Writing of French composition, reading, translation, dictation, conversation. For students who have had one year of college French, or two or three years of average grammatical preparation below college level.

2-255. French Conversation

Fall, 2 credits. Repeated in Spring — Marguerite Etienne

Designed to develop in students a fluent style of idiomatic conversation on topics most likely to be met in travelling in French speaking countries. Grammar review only if deemed necessary. Some composition and dictation exercises. Reading of current French newspapers and magazines. *Prerequisite:* Two years

of college French or the equivalent; a good knowledge of grammar and a sizeable vocabulary.

German

2-66. Reading Scientific German

Fall, non-credit. Repeated in Spring — Marianne Lederer

A course designed for those who need a reading knowledge of scientific German in their work or in order to meet language requirements for an advanced degree. No previous study of the language is required.

2-76. Reading German—General Vocabulary

Fall, non-credit. Repeated in Spring and Summer — Marianne Lederer, Herbert Schaumann

A course designed for those who need a reading knowledge of German with a non-scientific vocabulary, in their work or in order to meet language requirements for an advanced degree. Vocabulary emphasis depends on the needs of the students registered. No previous study of the language is required, or the course may be used as a review.

2-88. German for Travelers

Fall, non-credit. Repeated in Spring — Magna E. Bauer

Accuracy and facility in the use of oral German through listening to spoken German, reading, word analysis, and particularly repetition of the "basic thousand words" in round-table conversation. Work will be adapted to the members of the class. The beginner will have a chance to acquire a working vocabulary; the more advanced student will have an opportunity to practice the correct use of words, phrases, and idiomatic expressions. For beginners in the language as well as those who have had one year or more of German.

2-259. Elementary German

Year, 3 credits each semester — Marianne Lederer

Essentials of German grammar. Reading and writing simple prose. Introduction to extensive reading. Some conversation. Training in the fundamentals required to go on to Intermediate German.

[2-260.] Intermediate German (Not offered in 1956–57)

Year, 3 credits each semester — Marianne Lederer

2-261. German Conversation

Fall, 2 credits. Repeated in Spring — Magna E. Bauer, Marianne Lederer

Development of facility in discussion and reading, use of idioms, writing and thinking in the language. *Prerequisite:* Two years of college German, or the equivalent.

Italian

2-270. Elementary Italian

Year, 3 credits each semester — Magna E. Bauer

Essentials of Italian grammar. Reading and writing simple prose. Introduction to extensive reading, some conversation.

2-271. Intermediate Italian

Year, 3 credits each semester — S. Bernard Finlay

Grammar review. Extensive reading and vocabulary building to provide an adequate foundation for understanding Italian texts and carrying on conversation. *Prerequisite:* One year of college Italian, or two or three years of average grammatical preparation below the college level.

Portuguese

2-290. Elementary Portuguese

Year, 3 credits each semester (alternate years) — Jacob Ornstein

Basic grammar and vocabulary. Reading, translation, conversion. For beginners.

Russian

2-45. Review of Elementary Russian

Summer, non-credit — George M. Saharov

General review of Russian grammar, accompanied with oral and written exercises. *Prerequisite:* A year course in elementary Russian, or the equivalent as approved by instructor.

2-295. Elementary Russian

Year, 3 credits each semester — George M. Korenev Rockwell, George M. Saharov, Eugenia Tarakus

Designed to give the student a sound foundation in basic Russian. Includes reading, writing, and speaking of Russian. Special attention is given to the fundamental rules of Russian grammar, Russian phonetics, and the mechanics of good reading and writing. The first semester covers the first 18 lessons of the textbook, "Bondar's Simplified Russian Method, Seventh Edition," and the second semester covers the second 18 lessons. Students should have a good knowledge of English grammar.

2-296. Intermediate Russian

Year, 3 credits each semester — George M. Saharov

Reading and translation, grammatical analysis, dictation and conversation in Russian. *Prerequisite:* One year of Russian which included the completion of a basic grammar text, Bondar or the equivalent.

2-297. Conversational Russian

Year, 3 credits each semester — George M. Saharov

This course is alternated with Advanced Russian, depending upon student demand. For students who have had at least two years of Russian language training.

2-299. Advanced Russian

Year, 3 credits each semester — George M. Saharov

Reading and translation of more advanced Russian texts, composition in Russian, oral and written translation from English to Russian. Conversation. *Prerequisite:* Two years of Russian.

Spanish

2-89. Spanish for Travelers I

Fall, non-credit. Repeated in Spring and Summer — Odilon Ponce

Acquiring a facility in the use of oral Spanish, including practical, every-day expressions helpful to those planning a trip to a Spanish-speaking country. For persons with and without previous study of the language.

2-90. Spanish for Travelers II

Spring, non-credit. Repeated in Summer — Odilon Ponce

Continuation of Spanish for Travelers I. For students who have had some Spanish conversation training or experience.

2-300. Elementary Spanish

Year, 3 credits each semester — Erwin Jaffe, Marjorie C. Johnston

Foundation work in grammar, vocabulary, reading, and translation.

2-301. Intermediate Spanish

Year, 3 credits each semester — Fernando R. Romero

Grammar review, more difficult reading and translation, use of idioms, writing and discussion in the language. *Prerequisite:* One year of Spanish at college level, or two or three years below college level.

2-302. Spanish Composition and Conversation

Year, 2 credits each semester — G. Medrano de Supervia

Thorough training in the structure of the language, through reading and discussion of Spanish newspapers, magazines and novels of today. Writing of compositions, commercial and familiar letters; helping student acquire ability to speak and understand everyday and colloquial Spanish. *Prerequisite:* Intermediate Spanish or equivalent.

2-574. Advanced Spanish Conversation and Literature

Year, 2 credits each semester — Rafael Supervia

Especially adapted for those having a fair knowledge of the Spanish language, who want to improve it by the readings of and comments on the masters of Spanish literature. *Prerequisite:* Ability to read, understand, and express oneself clearly in Spanish.

Mathematics and Statistics

DEPARTMENTAL COMMITTEE

B. R. Stauber (Chairman)

Joseph F. Daly
Harold F. Dorn
Margaret J. Hagood
Morris H. Hansen
Earl E. Houseman

The Statistician and His Education

Unprecedented dependence is being placed on statisticians by administrative officials in government and private business all over the world. The statistician, through his specialized training, is able to provide current and comprehensive information on many subjects, and to do so with speed and economy. His specialized techniques are indispensable in industry.

The making of a statistician is a long and exacting process—several years of graduate study, plus at least a year and a half of high-grade experience under competent leadership. Educational facilities are strained, not only because of the heavy and increasing demand but also because the educational requirements placed on the statistician today are of an entirely different order of magnitude than they were a few years ago.

The courses described on the following pages accordingly provide training not only in theoretical principles, but training also in the administrative and research uses of data, as well as in the collection and processing of data and in the development and supervision of the minor skills necessary for carrying out statistical work.

In the design of a survey the statistician is concerned with the reliability and the cost of the figures that are to be obtained. Reliability is affected by many sources of error, which can be classified under two groups: (a) biases that are common to both complete counts and samples; (b) sampling errors. A thorough understanding of both types of error is essential in the work of the statistician. The statistical courses listed on the following pages deal mainly but not entirely with sampling errors. Proficiency in one or another branch of subject-matter such as sociology, economics, agricultural science, engineering, or some other specialized field, is essential for a full appreciation of the first type of error and for that reason collateral studies in one or more fields of science are advised and in fact are insisted upon in work leading to a Certified Statement of Accomplishment in Statistics.

Internships in Sampling

COMMITTEE

B. R. Stauber (Chairman)

William G. Cochran
Morris H. Hansen
Sterling R. Newell
S. McKee Rosen
Irving Siegel
Frederick F. Stephan

In recognition of the need for statisticians with thorough theoretical training and with experience in large-scale statistical projects under competent leadership, and in recognition of the exceptional facilities in Washington for specialized training in this field, the Graduate School has undertaken to present to qualified students the opportunity to pursue their studies under a system of internships. Under this program a limited number of qualified persons have a unique opportunity to combine advanced study with practical experience in sampling.

Internship Program

The internships provide opportunity for research work under leading authorities. The program is planned on an individual basis, depending on the experience, training and interests of the candidate. The internships are intended to supplement, not supplant, work offered in universities.

The following agencies have cooperated in the program:

Agricultural Marketing Service
Bureau of the Budget
Bureau of the Census
Bureau of Labor Statistics
National Bureau of Standards
National Institutes of Health
National Office of Vital Statistics

The internship consists of two integrated parts:

(1) classroom training in courses at the Graduate School or at other educational institutions in the city;
(2) work experience in government agencies on large-scale statistical sampling and testing programs.

Length: Twelve or eighteen months; the length of time spent in the internship is determined by the training and experience of the applicant.

Qualifications: Doctorate (a) in mathematical statistics, or (b) in a field such as agriculture, business, economics, social psychology, engineering. By arrangement, an intern may combine his internship with work on a doctoral thesis.

Selection

Each application is reviewed and approved or rejected by the Committee on Internships in Sampling. The Committee helps the intern plan his program and consults with him from time to time concerning his progress. Where the intern program is being developed as a research project, serving as a basis for a doctoral dissertation, the Committee keeps the university informed of progress.

Stipends

The internships carry no stipends. The Graduate School makes and offers no living arrangements.

Fees

The only fees charged are nominal course fees for those courses in which the intern is registered.

Application

Address the application to the Director, Graduate School, Department of Agriculture, Washington 25, D. C., and include the following information:

(1) Name
(2) Date and place of birth
(3) Transcripts of previous academic work
(4) Citations or copies of publications or technical papers
(5) Fields of specific interest and circumstances surrounding application (i.e., purpose, whether applicant would devote full time to internship, etc.)

Applications should be submitted well in advance of the beginning of the fall semester in September to insure adequate arrangement of work schedules and course programs.

Certified Statement of Accomplishment in Statistics

A Certified Statement of Accomplishment is offered in each of three fields of statistical study—fields representing areas of statistical preparation and application most useful in the public service. The required program in each field is outlined on page 33. The student who holds a bachelor's degree and who completes the basic courses and earns 24 credits in specialized courses listed in any column, with substitutions only as specifically approved, is eligible to receive a Certified Statement of Accomplishment. It certifies that the student has completed a program of study which, in conjunction with collateral training in a subject-matter field of application, prepares him for effective public service in a particular statistical field.

COURSES LEADING TO CERTIFIED STATEMENTS OF ACCOMPLISHMENT IN STATISTICS

(With Concentration in One of the Following Fields of Application)

BASIC COURSES—Required of all candidates

THE SOCIAL SCIENCES	THE NATURAL SCIENCES	MATHEMATICAL STATISTICS
College Algebra, Plane Trigonometry, and Analytic Geometry	College Algebra, Plane Trigonometry, and Analytic Geometry	College Algebra, Plane Trigonometry, and Analytic Geometry
Principles of Statistical Analysis	Principles of Statistical Analysis	Calculus
		Principles of Statistical Analysis

SPECIALIZED COURSES

3-206. Calculus	3-206. Calculus	3-400. Introduction to Mathematical Statistics
3-400. Introduction to Mathematical Statistics	3-400. Introduction to Mathematical Statistics	3-415. Higher Algebra
3-415. Higher Algebra	3-405. Introduction to Experimental Statistics	3-735. Theory of Sample Surveys
3-435. Sampling in Social and Economic Surveys	3-415. Higher Algebra	3-752. Advanced Theory of Probabality
or	3-571. Design, Philosophy, and Interpretation of Experiments	3-571. Design, Philosophy, and Interpretation of Experiments
3-735. Theory of Sample Surveys	or	
	1-570. Design of Experiments in Biological Sciences	

ELECTIVE COURSES

3-502. Differential Equations	3-571. Design, Philosophy, and Interpretation of Experiments
3-532. Introduction to Linear Programing	3-752. Advanced Theory of Probability
3-533. Introduction to Operations Research	3-587. Problem Analysis
3-538. Methods of Mathematical Analysis	

Mathematics

3-1. Review of College Freshman Mathematics

Fall, non-credit — Robert S. Titchen

A review course at the level of freshman mathematics. Algebra, trigonometry, analytic geometry. A brief introduction to the methods of the differential calculus. Emphasis on applications to statistical problems. *Prerequisite:* One year of college mathematics.

3-2. Review of Calculus

Spring, non-credit. Repeated in Summer — Clement F. Kent

Variables, functions, limits, divided differences, derivatives, application of derivatives to geometry, engineering curve fitting and analysis. Transcendental functions, polar equations, differentials, mean value theorem, techniques of integration and engineering application. Series and expansion of functions. *Prerequisite:* Calculus.

3-5. Review of College Algebra

Summer, non-credit — Howard Edelson

A review course for persons who have completed a course in college algebra and now need a refresher course either for their work or so that they may go on to more advanced courses in mathematics.

3-100. Commercial Algebra

Fall, 3 credits (alternate years) — Ralph R. Botts

Fundamental algebraic operations applied to business problems involving simple interest, bank cash and trade discount, commutation of debts, partial payments and the equation of accounts, compound interest, and present value. Algebraic language and common commercial terms will be explained. Some attention will be given to the use of graphs, logarithms, simultaneous equations, quadratic equations and the binomial theorem as they apply to the solution of business problems. An intermediate course between Everyday Mathematics and Mathematics of Accounting and Investment.

3-102. College Algebra

Fall, 4 credits. Repeated in Spring — Howard Edelson, Perry Taylor

Fundamental rules of algebra; exponents; logarithms; manipulations with proportions; identities and conditions; solution of equations; binomial theorem; numerical approximations. Uses of symbolic operators. Elementary determinants; solution of equations by the reciprocal matrix. Theory of equations; progression; series. Permutations and combinations. Graphical methods. Emphasis on applications to statistics and the physical sciences. *Prerequisite:* High school algebra and plane geometry.

3-103. Trigonometry and Analytic Geometry

Fall, 4 credits. Repeated in Spring — Howard Edelson

Basic definitions and uses of trigonometric functions; logarithmic solutions; radian measure; fundamental identities; oblique triangles; polar coordinates, inverse trigonometric functions; complex numbers and De Moivre's theorem; graphs of the functions and the inverse functions; introduction to spherical trigonometry.

Fundamental concepts and formulas; line, circle, parabola, ellipse, hyperbola; transformation of coordinates; polar coordinates; parametric equations; the second and higher degree equation in rectangular coordinates; graphic solu-

tion of equations; introduction to solid analytic geometry. *Prerequisite:* College algebra.

3-104. Trigonometry

Summer, 2 credits — Randall D. Esten

Basic definitions and uses of trigonometric functions; logarithmic solutions; radian measure; fundamental identities; oblique triangles; polar coordinates, inverse trigonometric functions; complex numbers and De Moivre's theorem; graphs of the functions and the inverse functions; introduction to spherical trigonometry. *Prerequisite:* College algebra.

3-206. Calculus

Year, 4 credits each semester — Joseph H. Kusner

First semester: Variables, functions, limits, continuity, derivatives. Applications of the derivative to geometry and physics. Maxima and minima. Differentials. Mean value theorem. Simple integration and applications to geometry and physics. Radius and circle of curvature. Vectors.

Second semester: Standard integral forms. Special methods of integration. Approximate integration. Improper integrals. Indeterminate forms. Taylor's formula with remainder. Infinite series. Partial derivatives. Multiple integrals. *Prerequisite:* Algebra, trigonometry and analytic geometry.

[3-415.] Higher Algebra (1957–58 and alternate years)

Year, 3 credits each semester — Randall D. Esten

Permutations and combinations, elementary probability, binomial and multinomial theorems. Theory of equations. Matrices, linear independence, orthogonality, partitioned matrices, and determinants; quadratic forms, linear transformations, latent roots of a matrix and characteristic function; numerical evaluation of determinants and solution of equations. *Prerequisite:* College algebra, trigonometry, and analytic geometry.

[3-502.] Differential Equations (1958–59 and every third year)

Year, 2 credits each semester — Robert H. Owens

Various types of ordinary differential equations. Solutions in series; the methods of Frobenius and others. Mechanical methods. Partial differential equations. Boundary problems. Fourier series and integrals; Legendre polynomials. Applications to conduction of heat and vibrating strings. Laplace's equation. Calculus will be reviewed as necessary. *Prerequisite:* Calculus.

[3-509.] Mathematics for Economists (1957–58 and alternate years)

Year, 2 credits each semester — Richard J. Foote

This course covers aspects of mathematics which are most useful to economists: algebra, geometry, differential and integral calculus, differential equations, and matrix algebra. At each stage, the mathematical methods described are used to solve problems based on economic theory or analysis. Part of the second semester is devoted to the use of matrix methods in fitting equations by least squares, in fitting systems of simultaneous equations, and in using such systems for analytical purposes. *Prerequisite:* A course in principles of economics.

3-532. Introduction to Linear Programming

Spring, 3 credits — Saul I. Gass

Covers the basic theoretical and computational aspects of linear programming. The formulation of many problems are analyzed and computational techniques discussed. Includes the following topics: the optimization of a linear

function subject to linear constraints, the simplex computational procedure, the duality theorems, the transportation problem, the contract awards problem, problems in production scheduling, additional applications, the equivalence of a zero-sum two-person game to a linear programming problem, parametric linear programming, and recent developments. Depending on the background of the students, the basic concepts of matrices, vectors and vector spaces, convex sets, and linear inequalities are discussed.

3-533. Introduction to Operations Research

Year, 3 credits each semester — Thomas L. Saaty

This course is designed to give the student perspective and technique for handling operational problems. Covers the basic mathematics useful in operations research, including probability and statistics, the optimum distribution of effort, queuing theory, game theory, the variational method, and information theory. Operations research projects are assigned. *Prerequisite:* College algebra, working knowledge of analytic geometry.

3-538. Methods of Mathematical Analysis

Year, 3 credits each semester — Thomas L. Saaty

The object of this course is to put at the disposal of the student mathematical techniques which have frequent application. From algebra, groups, matrices, equations, inequalities (linear programming and game theory) are discussed with applications. From analysis, differential equations (ordinary and partial), infinite series, general functions (convex and others), transcendental functions, and asymptotic phenomena. From topology, fixed point theorems and polyhedra with applications to differential equations and game theory. An introduction to differential geometry and tensors. *Prerequisite:* Calculus and differential equations.

3-587. Problem Analysis

Summer, 2 credits — Thomas L. Saaty

This course aims at developing in the student the ability to solve problems of a logical, mathematical, physical, and operational nature, with special emphasis on practical problem solving. The course attempts to develop creativeness in the formulation and solution of meaningful problems. The major content of the course is based on contributions to the field made in the past ten years. *Prerequisite:* A course in calculus.

3-752. Advanced Theory of Probability

Year, 3 credits each semester (alternate years) — Instructor to be announced

Permutations, arrangements, and combinations; conditional probability; compound probability; repeated trials; Bayes' formula; simple Markoff chains; problem of runs; difference equations; Bernoulli's theorem; games of chance; law of large numbers; Markoff and Khintchine theorems; probabilities in continuum; Stieltjes integral; fundamental limit theorems; probability and statistical distributions; limit theorems for sums of independent vectors; method of moments and its applications. *Prerequisite:* Advanced calculus or equivalent.

Statistics

3-126. Introductory Statistics

Year, 2 credits each semester. Repeated in Spring and Summer

C. M. Purves
Otto Rauchschwalbe

The collection of data. The presentation of data in tables and charts. Different kinds of averages. Dispersion. Introduction to index numbers. Re-

lations between two or more variables. Introduction to correlation theory, regression, and interpretation of samples. Practice in calculations. *Prerequisite:* High school algebra and geometry.

3-135. Elements of Statistical Drafting

Spring, 2 credits — Nelson P. Guidry

A practical course in drafting involving actual preparation of statistical maps and charts in class. Explanations of short cut methods of lettering technique and arrangement of component parts of illustrations. Complete illustrations will be prepared in ink ready for publication. The reduction, reproduction, and color application to statistical maps and charts will be explained. Students supply their own drafting tools.

3-136. Graphic Methods of Presenting Statistics

Fall, 2 credits. Repeated in Spring — R. G. Hainsworth

Analysis of statistical data to determine what form is best for graphic presentation. Application of data to the many types of illustrations in several forms of the various classes. Rough pencil layout examples of time series charts, frequency diagrams, graphic correlation charts, pictorial symbol charts, cartograms and other illustrative examples will be prepared in class. Comparability and evaluation of individual charts and maps in a series will be analyzed. *Prerequisite:* An introductory course in statistics, Elements of Statistical Drafting, or experience approved by the instructor.

3-318. Machine Tabulation I

Fall, 2 credits. Repeated in Spring — Milton Kaufman

Designed principally for statisticians, accountants, and operators of punch card tabulating equipment. The instruction covers the principles of operation, functions, applications, limitations, etc. of the various types of IBM equipment such as card punching and verifying machines (including types 24 and 26), sorters, alphabetic accounting machine (type 402), reproducing punches, and other auxiliary machines. *The course covers instruction in the basic wiring of the machines.* More than half the course is spent on the alphabetic accounting machine (type 402). Instruction also deals with the principal Remington Rand punch card tabulating equipment. The course is not intended to train personnel in the physical operation of the various machines.

3-319. Machine Tabulation II

Fall, 2 credits. Repeated in Spring — Milton Kaufman

Designed principally for statisticians, accountants, operators, and supervisors of punch card tabulating equipment. The instruction covers the principles of operation and functions of the IBM accounting machines, type 407 and the collating machines, types 77 and 89. *The course covers instruction in the wiring of the machines including the solution of advanced wiring problems. Prerequisite:* Machine Tabulation I or knowledge of the basic wiring of tabulating equipment.

3-380. Principles of Statistical Analysis

Year, 3 credits each semester — B. Ralph Stauber

The purpose of the course is to lay a thorough foundation of the basic concepts and principles of statistical analysis, and to develop in the student an understanding of their application to scientific investigation. The course includes elementary probability; the binomial, Poisson, and normal distributions; introduction to sampling; statistical tests of significance; simple and multiple correlation; some theory of determinants with applications to correlation and the inverse matrix; introduction to analysis of variance and covariance; elementary principles of design and analysis of surveys and experiments; use of statistical

tables by Fisher, Yates, and others. *Prerequisite:* A working knowledge of algebra, trigonometry, and analytic geometry; an elementary course in statistics is desirable.

3-400. Introduction to Mathematical Statistics

Year, 3 credits each semester (alternate years) HARRY WEINGARTEN

A foundation course. A broad introduction to modern mathematical statistics, as preparation for further work in mathematical statistics for an advanced degree, or for a certified statement of accomplishment. Estimation: bias, consistency, efficiency. Testing statistical hypotheses. Solution of problems. Powers of various statistical tests. Use of moment generating functions to solve distribution problems. Methods of solution when the underlying distribution is unknown. Design of experiments and of sample surveys. *Prerequisite:* Calculus and Principles of Statistical Analysis or equivalent.

3-405. Introduction to Experimental Statistics

Year, 2 credits each semester WALTER A. HENDRICKS

A non-mathematical course in the analysis and interpretation of data from agricultural and biological experiments. Elementary probability relationships; binomial, Poisson, and normal frequency distributions; the concept of sampling error; tests of significance of differences between averages; the chi-square test as applied to differences between observed and expected frequencies; regression and correlation; and elementary discussions of analysis of variance and covariance. Numerical examples. *Prerequisite:* College training in agriculture or a biological science; familiarity with ordinary methods of tabulating experimental data, computation of averages and the preparation of graphs.

3-408. Principles of Sample Design and Analysis in Agricultural Surveys

Year, 2 credits each semester WALTER A. HENDRICKS

For students with a good working knowledge of statistical methods and elementary college mathematics who wish to become familiar with the design of sampling investigations, and the analysis of sample data, particularly in the field of agricultural surveys. Emphasis is on developing an understanding of principles of sample allocation, choice of sampling unit, computation of estimates of universe parameters from sample data, and the estimation of sampling errors and variance components. All important sample designs in current use (random, systematic, stratified, multistage, cluster) are discussed from that viewpoint. The background and interpretation of the basic formulas are developed through applications to numerical data. *Prerequisite:* Principles of Statistical Analysis, or its equivalent, and at least one year of college mathematics.

3-435. Sampling in Social and Economic Surveys

Fall, 3 credits (alternate years) HAROLD NISSELSON

Non-mathematical survey of sampling theory and practice. Development of the basic ideas of statistical sampling, with applications in social and economic surveys. Unrestricted random, stratified, systematic, area and cluster sampling, and subsampling. Sample designs used in the United States and in foreign countries are discussed with respect to considerations of statistical efficiency, cost functions, and the administrative limitations imposed on the design. *Prerequisite:* A course in elementary statistics.

3-480. Statistical Methods and Experimental Design

Spring, 12 credits JAMES G. OSBORNE and AUSTIN A. HASEL

Application of statistical methods to research work in the Forest Service stressing the logic of experimentation and the techniques of design, analysis, and

interpretation of experiments or surveys. Emphasis is placed on: testing hypotheses in forest research; distribution of sample statistics; tests of significance. Registration limited to qualified research personnel of the Forest Service.

3-560. Theory of Electronic Digital Computing Machines

Fall, 2 credits — Instructor to be announced

Mathematical requirements for electronic digital computers. Alternative methods of sequencing automatic computers—instruction codes. Electronic computer systems and components—internal memory, control, arithmetic unit, input-output devices. Performance characteristics of electronic computers; analysis of errors. Preparation of problems for machine solution. *Prerequisite:* Advanced calculus or differential equations.

3-565. Data Processing on Electronic Computers I

Fall, 2 credits. Repeated in Spring — Dorothy P. Armstrong, Lancelot W. Armstrong

Provides a basic understanding of the capabilities and limitations of large-scale, high-speed electronic digital computers in general. Description of equipment presently available. The instruction code cited is that of the Univac system. Covers the following: types of computing equipment; organization of an electronic data processing system; notation and information units; machine functions; the Univac instruction code; logical flow charts; basic computer coding; coding techniques for standard operations; use of auxiliary equipment.

3-566. Data Processing on Electronic Computers II

Spring, 2 credits — Dorothy P. Armstrong, Lancelot W. Armstrong

A continuation of Data Processing on Electronic Computers I for those who are interested in obtaining a more detailed knowledge of the preparation of computer programs. Emphasis on sorting, file maintenance, use of reference tapes, testing programs, preparation of test material, use of breakpoints, service routines, preparation of operating instructions, minimum latency coding, and automatic coding.

3-571. Design, Philosophy, and Interpretation of Experiments

Year, 3 credits each semester — Instructor to be announced

Basic philosophy of the experimental method. Characteristics of a good experiment. Experimental designs and the associated statistical techniques for analyzing data. Methods for improving the precision of experiments. The main emphasis is upon the assumptions and procedural requirements that permit sound statistical inference rather than upon mechanics of the analysis. A critical appraisal of the appropriateness of widely used design and analysis techniques, and treatment of some recently developed or not widely known techniques designed to handle special problems. Problems submitted by students are used wherever appropriate. *Prerequisites:* Principles of Statistical Analysis, a course in analysis of variance or design of experiments, or consent of the instructor.

1-570. Design of Experiments in the Biological Sciences

(See p. 16)

3-735. Theory of Sample Surveys

Year, 2 credits each semester — JOSEPH STEINBERG

History of sampling in social surveys. The use of statistical control in improving the quality and efficiency of the estimates. Calculation of sampling errors. Random, stratified random, purposive, double and systematic sampling. Cost function, choice of sampling unit; size and type of sample necessary to attain a stated degree of precision, and the distinction between precision and accuracy. The theory of probability is developed as necessary. The contributions of Fisher, Neyman, Yates, Cochran, and others are studied. *Prerequisite:* Principles of Statistical Analysis and Calculus.

3-025. The Organization of Statistical Services within the Federal Government—Seminar

Fall, non-credit — WALTER F. RYAN

The Federal statistical system: its growth, organization, major characteristics, and functions. A series of four lecture-seminars meeting at 3:30 to 5:00 P.M. on October 3, October 17, October 31, and November 14. No registration is required; no fees are charged.

Office Techniques and Operations

DEPARTMENTAL COMMITTEE

HENRY A. DONOVAN (Chairman)

ROBERT H. FUCHS	MARK M. KIRKHAM
KELSEY B. GARDNER	JOHN S. LUCAS
WILLIAM S. HARRIS	WILLIAM L. MOORE (Vice-chairman)
ZELMA J. HICKS	EDMUND STEPHENS

The courses offered in this department are practical, how-to-do-it courses of interest chiefly to persons who are working with these procedures, or who hope to train themselves for such positions. They are helpful also to persons in positions requiring some familiarity with more than one of the procedures (e.g., supervisors and administrative assistants), and to persons at the higher levels of responsibility who wish to become acquainted with the details of the operations.

CERTIFIED STATEMENT OF ACCOMPLISHMENT IN ADMINISTRATIVE PROCEDURES

The program leading to a Certified Statement of Accomplishment in Administrative Procedures should be of special interest to:

1. **Persons already employed in administrative work of the procedural type, emphasizing techniques and skills.**
2. Employees who aspire to enter administrative work.
3. **Employees who wish to prepare to become administrative assistants or to head units concerned with administrative procedures.**

Requirements

1. High school diploma or equivalent.
2. Sixteen semester hours of credit with grades of "C" or better in Graduate School courses, distributed as follows:
   a. A course in American National Government.
   b. A minimum of eight credits (in addition to *a* above) selected from courses above the 100 level in the Department of Office Techniques and Operations or the Department of Public Administration, or a combination of these. Courses in accounting may not be included, except Federal Fiscal Procedure and Federal Government Accounting.
   c. The remaining credits may be selected from courses, not included above, in the Department of Office Techniques and Operations, excluding all shorthand courses.

d. A course in elementary statistics may be included. It is not required. If it is included, three credits may be deducted from *c* above.

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Clerical-Administrative Procedures

4-101. Everyday Mathematics

Fall, 2 credits. Repeated in Spring and Summer — Ralph R. Botts, C. M. Mouser

Designed for clerical workers who are called upon to apply fundamentals of arithmetic to their jobs. Emphasis is placed on review of business arithmetic, including fractions, decimals, ratios and percentages. Special applications are made to civil service and business problems such as bank, cash and trade discount, profit and loss, payrolls, simple and compound interest, fire insurance, stocks and bonds, property and income taxes, and the determination of interest rates charged on time purchases and small loans. Use of the calculating machine is explained.

3-100. Commercial Algebra (See p. 34)

4-108. Administrative Procedure

Fall, 2 credits. Repeated in Spring and Summer — Thomas J. Hickey

Intended for persons who wish to become supervisors or administrative assistants or who are now serving in such capacity in a small organizational unit. Deals with the aspects of the day to day assignments for which these persons ordinarily are responsible, such as preparation of budget data for small organizational units; the proper establishment of authority and responsibility and organization structure; fundamentals of personnel administration; essential requirements for good supervision.

The second part of this course deals with the introduction to administrative planning, administrative procedures and management generally at the lowest organization level, including work reporting and work measurements, work processes and work control reports; relation of these studies to the budgetary and personnel needs of the unit; and the theory of staff versus operating jurisdiction over administrative planning.

4-201. Supervision

Fall, 2 credits. Repeated in Spring and Summer — Mark M. Kirkham

A course for persons who have or expect to have first-line supervisory responsibilities. Particular emphasis will be placed upon the need for understanding human behavior and attitudes as they manifest themselves in group efforts. The dynamic setting in which supervisory responsibilities are discharged, its importance to management, the individual qualities and specific techniques employed by supervisors to improve work methods will be considered, and a program of self-development and self-evaluation in the art of supervision suggested.

4-206. Essentials of Good Management

Fall, 3 credits. Repeated in Spring — Glenn D. Wagner

Designed to give employees and supervisors a better understanding of the principles and methods of effective office management, and to increase their proficiency in their work. Deals with the practical day-to-day problems and questions encountered in managing an office, such as organizing for effective opera-

tion, the essentials of good supervision, the planning and control of office work, paper-work management, utilization of office equipment and services, dealing with personnel and human relations problems, securing coordinated effort and teamwork, effecting improvements.

4-112. Federal Fiscal Procedure

Fall, 2 credits. Repeated in Spring — Louise M. Krueger

This course is designed for persons who have no prior knowledge of Government fiscal procedures and who wish to enter the field of fiscal operations, and for those who wish to increase their knowledge in order to prepare themselves for more responsible positions. Covers the basic fiscal procedures, laws, regulations, and principles involved in the administrative examination of travel, transportation, procurement and other types of vouchers, the processing of payrolls, the handling of leave and retirement, the scheduling and coding of vouchers, and the handling of collections and claims. Case studies are used and applicable Comptroller General decisions in each area are interpreted.

4-113. Federal Property Procedure

Spring, 2 credits — Ralph G. McIntyre

An intensive one-semester course covering laws, regulations, and principles dealing with control, utilization, and disposal of Federal personal property. Designed to furnish persons currently employed in this field an opportunity to study approved accountability and control systems, including management techniques, capitalization policies, general ledger controls, audit and inspection requirements, inventory controls, and accountability methods; utilization policies and procedures, including development and application of use, replacement, and preventive maintenance standards; management through inventory controls, surveys, and inspections; disposal policies and procedures, including transfers, donations, sales, abandonment, and destruction; statistical reporting of motor vehicles.

4-114. Federal Personnel Procedure

Fall, 2 credits. Repeated in Spring — Verna C. Mohagen

Deals with the elementary principles and procedures of Federal personnel administration, including a study of the Federal personnel structure and organization, history and progress of the merit system, rules and regulations of the Civil Service Commission, and other basic procedural sources; use of personnel forms and records; Civil Service examinations and recruitment; appointments; transfers; promotions; separations and reductions in force; suspensions and disciplinary actions; retirement; performance ratings; leave and hours of duty; personnel reports, applications of Decisions of the Comptroller General, administrative policy statements, and administrative orders.

4-214. Advanced Federal Personnel Procedure

Fall, 2 credits. Repeated in Spring — Eugene J. Peterson

Continuation of Federal Personnel Procedure, with more intensive treatment of the subjects covered. Advanced principles and tchniques in Federal personnel procedures and their relation to operating programs; recruiting sources for Civil Service examinations and appointments; study of promotion-from-within policies and procedures; reduction-in-force procedures and their application to specific operating situations; study of procedures for systematic retirement of employees reaching annuity age; periodic reports and their use for operating purposes; procedural source materials such as the Civil Service Commission, Federal Personnel Manual, Decisions of the Comptroller General, Executive Orders etc.,

and their application to operating procedures; relationship of the personnel office to budget, accounting, payrolling, and other staff functions.

4-115. Federal Purchasing Procedure

Fall, 2 credits — Tony M. Baldauf

For persons who are in purchasing work or who wish to enter the field. Covers the historical and legal background of Federal purchasing, professional concepts in purchasing, current legal requirements, purchasing procedures from open market and Federal sources of supply, and purchasing techniques; the practical application of such requirements through the preparation of purchase documents; the study of case problems involving legal or administrative restrictions or requiring the application of purchasing principles.

4-116. Federal Budgetary Procedure

Fall, 2 credits. Repeated in Spring — Jesse B. McWhorter

This course is designed to assist employees either in budget work or preparatory to taking budget work, up to and including Grade GS-9. It deals with budgetary procedures, including the preparation of estimates, justifications, tabular statements, graphs, etc., and, in connection with budget execution, outlines methods in making allotments, preparation of apportionment and obligation reports, and other methods used in the formulation and execution of the Federal budget.

4-117. Records Management Procedure

Fall, 2 credits — Dorothy M. Luttrell and Robert H. Lando

A course of instruction in how to process, maintain and service records, designed for students who desire to enter the records management field or who are interested in supplementing their knowledge of the mechanics and techniques of record operations. Includes detailed instructions in methods of (1) recording and controlling communications, (2) classifying, coding and indexing correspondence and other record material, (3) filing records and references, and (4) furnishing records reference service, including the establishment and operation of charge-out and follow-up systems. This course also provides study and discussion of (1) the theory and structure of the various systems of classification and filing, (2) the selection of the proper systems of classification for individual requirements, and (3) the development of individual classification and filing patterns.

4-217. Advanced Records Management

Spring, 2 credits — Dorothy M. Luttrell and Robert H. Lando

An advanced course designed to give students a comprehensive knowledge of the management of Government records. The study of Federal laws and regulations governing the creation, maintenance, protection, preservation and disposition of records and action necessary for meeting these statutory and regulatory requirements including: (1) records management program activities; (2) planning and conducting records management surveys; (3) inventorying and evaluating records; (4) analyzing records management problems and formulating solutions to such problems by the application of management techniques to the organization and maintenance of current records and the disposition of noncurrent records; (5) the development and application of records retention and disposal standards; and (6) the appraisal, retirement, storage, microfilming and disposal of records. *Prerequisite:* Records Management Procedure or consent of instructor.

4-330. Government Letter Writing

Fall, 2 credits. Repeated in Spring and Summer — Lucile N. Boyd, Verne L. Samson

Intended for persons in administrative positions who are called upon to handle administrative problems through correspondence. The writing of clear, accurate, concise, courteous letters and memoranda. Principles of effective letter writing. Practice in criticizing and revising outgoing correspondence, and in planning and drafting replies to incoming letters. *Prerequisite:* A good foundation in English grammar, vocabulary, and composition, through courses or writing experience.

4-421. Writing Procedures and Instructions

Spring, 2 credits — Kay Pearson and Ernest T. Spiekerman

A course of instruction in how to develop and write manual issuances, circulars, office memoranda, and other forms of rules, regulations, instructions, and procedures. Special attention will be given to ways of improving readability of such material, the use of a clear, simple style of writing, proper format, and use of "ready-reference" aids. It will provide drill in the practical application of principles and theories of procedure to actual writing. The purpose of the course is to provide students with group experience in writing procedures and instructions and in applying editorial and format standards. *Prerequisite:* Management of Procedure and Correspondence Systems, or experience in writing procedures at Grade GS-5 or above.

Shorthand

These courses are designed to furnish Federal employees an opportunity to follow a program of training for stenographic careers in the Federal service. While each course represents a separate unit of study, with emphasis on material used in the Federal service, a proper sequence of courses insures a sound foundation for successfully qualifying for the various grades and classifications of stenographers in the Federal service.

"Review of Gregg (Anniversary)" will serve as rapid review for the student who has not applied his shorthand knowledge for a long time, or has used it so little that he feels uncertain about applying his knowledge to practical office dictation. Students wishing a review of Gregg Simplified should enroll in "Gregg, 60 to 80 Words."

Home study is required in all the courses to attain goals set in course descriptions. Amount of study required varies according to the learning habits and individual goals of students.

A prerequisite for all shorthand courses is the ability to typewrite with a fair degree of accuracy and speed.

Students who are planning to take the CPS (Certified Professional Secretary) examination will find, in addition to the courses in shorthand, the following courses of interest: Introduction to the Study of Human Relations, Supervision, Everyday Mathematics, Principles of Economics, and Business Law.

4-89. Review of Gregg Shorthand (Anniversary), 60–90 Words

Fall, non-credit. Repeated in Spring and Summer

Frances A. Butler
Harriet E. Stern

A review of theory and brief forms. Reading from shorthand plates and students' own notes; dictation of standard material at various progressive rates of speed. *Prerequisite:* Completion of the Gregg Manual or its equivalent by the Anniversary system.

4-129. Gregg Shorthand Simplified I

Fall, 3 credits. Repeated in Spring and Summer

Kathrine Wilkey Gaasterland
Evelyn J. Robeson
Edith Weltner

Covers the theory of Gregg Shorthand Simplified. Beginning dictation on new and practiced material.

4-130. Gregg Shorthand Simplified II

Fall, 3 credits. Repeated in Spring and Summer

Margaret O. Hobbs
Kathrine Wilkey Gaasterland
Edith Weltner

Increasing mastery of principles of Gregg Shorthand Simplified, by review and drill. Minimum dictation speed of 60 words a minute attained, with accurate transcripts, on new standard material. *Prerequisite:* Gregg Shorthand I or equivalent.

4-225. Gregg Shorthand Simplified, 60–80 Words

Fall, 3 credits. Repeated in Spring and Summer

E. Donald Bell

Theory review: brief forms; word beginnings and word endings; preliminary phrasing. Extensive dictation practice, using general business and governmental material. In-class and outside transcription. Sample Civil Service test material. Maximum dictation speed of 80 words a minute attained. *Prerequisite:* Shorthand I and II or equivalent theory and dictation courses, and a minimum speed of 60 words a minute on new, standard material.

4-226. Gregg Shorthand, 80–100 Words

Fall, 3 credits. Repeated in Spring

Nora M. Walker
Edrie C. Way

For those who have a minimum dictation speed of 80 words a minute using either the Simplified or Anniversary system, and who are able to produce accurate transcripts of letters and reports. Students who are weak on theory should take either 4-89 or 4-225 before enrolling in this course.

Physical Sciences

DEPARTMENTAL COMMITTEE

HENRY STEVENS (Chairman)

MILDRED C. BENTON
ALBERT V. CARLIN
ELSA O. KEILES
ARNOLD J. LEHMAN (Vice-chairman)
JOSEPH B. LEVY
JOHN LYMAN
LOUIS C. PELTIER
MAURICE J. TERMAN

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The courses in this department offer unusual opportunities for study under the guidance of scientists working in this field. The program will be of value to students who plan to enter these sciences; to those who desire to increase their knowledge of the science in which they now earn their living; and to those who wish, for cultural reasons, to learn more about these fields.

Most of the courses in this department are seminars designed to keep professional workers informed of recent developments in their fields and do not include laboratory work. A few of the courses offer basic training and, as indicated in the course descriptions, include laboratory work.

In addition to the courses listed below, the Graduate School offers several courses in the physical sciences at the National Institutes of Health in Bethesda. These courses may be found on page 100 of this catalog.

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GENERAL

5-225. The Principles of Physical Science

Year, 2 credits each semester — MICHAEL J. PALLANSCH

A survey course designed for persons who work with scientific material but who may not have scientific training. It is of particular interest to librarians, information specialists, editors, research assistants and others who have a general interest in current developments in the physical sciences. The fundamental concepts held common in the fields of physics, chemistry, medicine, and cosmology are studied in relation to the recent developments in atomic power, space travel, synthetic fibers, antibiotics, human nutrition, and other subjects of current interest.

Although it is recommended that the two semesters be taken in sequence, each semester is taught as an independent unit and students may enter the second semester without the first. In general, the topics in the first semester will be taken from the field of physics, and the second semester from the field of chemistry.

Chemistry

5-65. Review of Elementary Organic Chemistry

Summer, non-credit — C. S. Prickett

General survey and review of material usually covered in first course in organic chemistry. Emphasis is on reaction chemistry and practice with synthetic methods based on important reactions. *Prerequisite:* Course in organic chemistry.

5-315. Elementary Biochemistry

Year, 2 credits each semester — Sidney M. Hess

A comprehensive survey of the chemistry of body constituents and metabolic conversion. The first semester covers the chemistry of carbohydrates, fats, proteins, and the fundamentals of enzyme chemistry. The second semester deals with digestion and absorption of food, intermediary metabolism, and the physiological role of vitamins and hormones. *Prerequisite:* Organic chemistry.

[5-349.] Physical Chemistry (1957–58 and alternate years)

Year, 2 credits each semester — William Horwitz

Lecture course on the states of matter—gases, liquids, and solids; elementary thermodynamics, solutions, homogeneous and heterogeneous equilibria including the phase rule; ionic equilibria, conductance, electromotive force; chemical kinetics and colloids. *Prerequisite:* General chemistry, qualitative and quantitative analysis, physics, and calculus, or permission of the instructor.

[5-400.] Advanced Organic Chemistry (1957–58 and alternate years)

Spring, 3 credits — W. I. Patterson

Emphasis on synthetic organic chemistry and determination structure. Discussion of reliable preparative procedures, including their scope and limitations. Brief review of classes of organic compounds, including an introduction to the chemical literature and nomenclature associated with the field. *Prerequisite:* Organic chemistry.

5-541. Theoretical Organic Chemistry

Spring, 2 credits (alternate years) — Joseph B. Levy

The theoretical aspects of organic reactions. Includes the theory of resonance, aromatic substitution, and in general the principles which govern and explain the way organic reactions occur. *Prerequisite:* Undergraduate course in organic chemistry.

5-545. Alkaloids, Glucosides, and Toxins of Biological Importance

Spring, 2 credits (alternate years) — Geoffrey Woodard and Specialists

Subject matter covers items such as morphine, nicotine, ergot and quinine (cinchonidine) alkaloids; cardiac glycosides; snake venom, mushroom, honey and shellfish toxins; and toxins of bacterial origin. Emphasizes the relation of chemical structure to biological activity and methods of analysis, either chemical or biological. *Prerequisite:* Degree in biology or chemistry, or equivalent; knowledge of organic chemistry desirable.

5-620. Advanced Inorganic Chemistry

Fall, 3 credits — C. S. Prickett

The chemistry of the less familiar elements as well as such special subjects as complexion formation, stereoisomerism of inorganic substances, etc., interpretation of chemical properties in terms of atomic structure. *Prerequisite:* Qualitative analysis, and physical chemistry or college physics.

5-625. Specialized Analytical Techniques

Fall, 2 credits — Geoffrey Woodard and Staff

A detailed discussion of some of the physical methods used in analytical work for determination, separation, or identification, particularly of organic compounds. Among the methods covered are ultraviolet, visible, and infrared spectrophotometry, partition, adsorption, and paper chromatography, and counter current distribution. Emphasis is placed on practical applications. Laboratory demonstrations are included where possible.

Geography and Geology

Students who are studying or working in the field of geography or geology may be interested, in addition to the courses listed here, in courses in Soil Sciences, Meteorology, and Surveying and Mapping.

5-114. Maps and Charts

Fall, 2 credits (alternate years) — Catherine I. Bahn

An introductory course designed to give the analyst, researcher, librarian or teacher who works with maps an understanding of both domestic and foreign maps and charts, the agencies which produce them, their catalogs and indexes. Presents methods in reading and problems in interpreting foreign maps. United States, foreign and international mapping activities are studied on a workshop basis to permit presentation and solution of individual problems. All types of maps, charts, aids and reference materials are available for laboratory use.

5-203. General Geology

Fall, 3 credits — Maurice J. Terman

Minerals and rocks as constituents of the earth's crust; processes of weathering, erosion and deposition; vulcanism; structures of sedimentary and igneous rock formations; diastrophism; mountain building; land forms and their relation to various geologic processes; stability of the earth's crust. The course includes classroom exercises in the study of common minerals and rocks, and interpretation of topographic and geologic maps. *Prerequisite:* Inorganic chemistry is desirable.

5-205. Practical Geology

Spring, 3 credits — Maurice J. Terman

A non-professional course describing the practical uses and economic aspects of geology. General background of historical and regional geology; brief analysis and comparison of exploratory methods; summaries of origins, occurrences, and distribution of ground water, petroleum, non-metallic and metallic mineral deposits; and a survey of the applications of geology to civil engineering. Assignments are made to familiarize the student with the utilization of geologic methods in each of these fields. *Prerequisite:* A knowledge of elementary physical geology or some familiarity with minerals and rocks is desired.

5-455. Photogeology

Fall, 3 credits — Richard G. Ray and William R. Hemphill

A course in interpretation of various geologic terranes from aerial photographs stressing recognition criteria of geologic data and final geologic interpretations based on these data. Lectures supplemented by seminar-type discussions of recent literature. *Prerequisite:* Physical geology and photogrammetry or permission of the instructors. Structural geology and geomorphology desirable.

5-635. Principles of Ground-Water Geology and Hydrology

Fall, 3 credits — Garald G. Parker and Associates

Basic principles of the science of ground-water geology and hydrology. Conservation and ground-water law. Solving of practical ground-water problems.

Soil Sciences

5-405. Soils—Their Origin and Geography

Spring, 3 credits (alternate years) — Constantin C. Nikiforoff

A descriptive course covering the basic principles of the origin of the soil as a function of the environment and the pattern of distribution of various soils throughout the world. The role of soil formation in broad geochemical and geophysical cycles and the geographical factors of soil formation such as climate, relief, and biological pressure are first discussed in non-technical terms, followed by several lectures dealing with the physical nature of soil and the geographical analysis of the soil pattern of various parts of the world. The dynamic nature of soils and relationships between soils, climate and vegetation are emphasized throughout the course. *Prerequisite:* Freshman chemistry or its equivalent. Previous training in plant ecology, physical geography, and climatology is desirable.

[5-531.] Soils: Their Morphology, Genesis, and Classification (1957–58 and alternate years)

Spring, 3 credits — Constantin C. Nikiforoff

The nature of soils and the broad principles governing their behavior are first discussed, followed by consideration of soil morphology, formation, and classification. Particular attention is given to characteristics of the great soil groups and their genesis in relationship to the physical and biological forces of the environment. Soil geography of the United States is dealt with broadly, but some examples from other parts of the world are used. Throughout the course, relationships of soil characteristics to agricultural development, soil use and conservation, and patterns of human occupancy are emphasized. *Prerequisite:* Freshman chemistry or its equivalent. Previous training in soils, plant physiology, geography or geology is desirable.

Meteorology

The following courses in meteorology are offered in cooperation with the United States Weather Bureau. The courses may be taken singly, or as a program leading to a certificate of accomplishment. Registration in these courses is not limited to employees of the Weather Bureau.

CERTIFIED STATEMENTS OF ACCOMPLISHMENT IN METEOROLOGY

Two Certified Statements of Accomplishment are offered in meteorology. The required programs are outlined below. The First Certified Statement of Accomplishment in Meteorology may be awarded to the student who satisfactorily completes the required courses totaling 19 credits. The Second Certified Statement of Accomplishment in Meteorology may be awarded to the student who completes the courses totalling 34 credits.

The required courses, Calculus and College Physics, are considered to be the absolute minimum in mathematics and physics. A more complete preparation, and the one recommended to the person who wishes to make of meteorology his professional career, will require courses also in differential equations and vector analysis. Courses in chemistry and statistics would be valuable, but not essential.

COURSES LEADING TO CERTIFIED STATEMENT OF ACCOMPLISHMENT IN METEOROLOGY

First Statement—Elementary

Required Prerequisite Courses:

- Calculus
- College Physics

Required Meteorology Courses:

- General Meteorology (3)
- Introduction to Dynamic Meteorology (6)
- Synoptic Meteorology (6)
- Weather Analysis and Forecasting (4)

Second Statement—Advanced

Courses required for the first statement plus the following:

Advanced Weather Analysis and Forecasting (6)

Electives (9 credits) selected from the following courses:

- Elements of Fluid Mechanics (6)
- Principles of Statistical Analysis (6)
- Tropical Meteorology (3)
- Applied Climatology (3)
- Selected Topics in Meteorology (6)
- General Oceanography (2)
- Marine Meteorology (2)

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5-162. Meteorology for the Non-professional

Fall, 2 credits ALBERT V. CARLIN

This is a course for people interested in knowing what is behind the weather, why weather changes, and what goes on in the atmosphere around them. The course is designed particularly for administrative, clerical, and secretarial people who work with professional meteorologists, to learn the meanings of the words and terms in meteorology with which they come in daily contact, and for non-meteorologists who have a layman's interest in the weather.

5-326. General Meteorology

3pring, 3 credits — Sigmund Fritz

A one-semester course in the fundamentals of the physical aspects of modern meteorology for the professionally interested student. Atmospheric composition and structure and their measurements; solar and terrestrial radiation, radiation laws; gas laws; adiabatic, pseudoadiabatic, and non-adiabatic processes; fronts; thunderstorms; fog; wind. *Prerequisite:* Two years of high school algebra and trigonometry.

5-415. Applied Climatology

Fall, 3 credits — Woodrow C. Jacobs

The application of well known climatological methods toward solving specific weather problems of business, industry, air and surface transportation, and agriculture. Emphasis is placed on application of climatological methods in the solution of applied problems. The case method of class presentation is employed throughout the course. *Prerequisite:* A knowledge of the basic principles of meteorology.

5-534. Introduction to Dynamic Meteorology

Year, 3 credits each semester — Morris Tepper

An introductory course consisting of the application of the general principles of mechanics, thermodynamics, and fluid motions to the study of the atmosphere and its movements. *Prerequisite:* College physics, and mathematics through differential and integral calculus.

5-535. Elements of Fluid Mechanics

Year, 3 credits each semester — Morris Tepper

A basic one year course in the foundation of fluid mechanics aimed at giving the student a physical feeling for the more important concepts and relationships involved in problems concerning the flow of fluids. Topics will include: Flow models, basic concepts such as density, pressure, vorticity, viscosity, capillarity, etc., conservation laws, Bernoulli's equation, dimensional reasoning, characteristic parameters such as Froude number, Reynolds number and Mach number, potential flow, surface waves, elements of viscous flow and an introduction to compressible flows. *Prerequisite:* College physics and mathematics through differential and integral calculus.

5-536. Synoptic Meteorology

Year, 3 credits each semester — Jay S. Winston

A two-semester course in the fundamentals of modern synoptic meteorology for the professionally interested student. First semester: Air motion in the atmosphere, the general circulation, air masses, fronts, cyclones and anticyclones. Second semester: Distribution of precipitation, fog, etc., geographically and with respect to fronts and pressure centers, features of the upper levels, prognostication of sea-level and upper-air charts, forecasting weather. *Prerequisite:* College physics and calculus; or consent of instructor.

[5-538.] Weather Analysis and Forecasting (1957–58 and alternate years)

Year, 2 credits each semester — Thomas I. Gray, Jr., and Jay S. Winston

A laboratory course in which concepts of air masses, fronts, and mid-tropospheric flow patterns are applied to analysis and prognosis of sea level and upper air weather charts for North American and adjacent areas. Short range forecasts of various weather elements are prepared for local and regional areas of the United States. *Prerequisite:* Synoptic Meteorology or equivalent.

5-580. Advanced Weather Analysis and Forecasting

Year, 3 credits each semester (alternate years)
THOMAS I. GRAY, JR., and JAY S. WINSTON

Weather data for various regions of the earth are analyzed. More detailed and experimental analysis of data is emphasized including: study and use of isentropic charts, constant vorticity trajectories, vertical motion computation, jet stream analysis, and frontal contour charts. Important forecasting problems, such as cold waves, heat waves, and severe regional and local storms are investigated. Objective forecast methods for various weather elements are discussed. Methods of extended period forecasting based on motion and development of planetary wave patterns are presented. Lecture and laboratory. *Prerequisite:* Weather Analysis and Forecasting, Synoptic Meteorology, or equivalent.

5-589. Tropical Meteorology

Spring, 3 credits LESTER F. HUBERT

Survey of major features of tropical climatology. Convection. Dynamics and kinematics of the tropics. Synoptic models. Hurricanes and typhoons. Forecasting, including hurricane path computation. Includes map analysis and laboratory work, in which streamline-isotach analysis is emphasized. *Prerequisite:* 20 hours of meteorology or the equivalent in experience, and calculus.

5-705. Selected Topics in Meteorology

Schedule to be arranged, 6 credits JAY S. WINSTON and OTHERS

An advanced seminar course designed to cover various aspects of the current state of meteorology. Review and discussion of articles from the Compendium of Meteorology and other sources. The topics covered are agreed upon by students and instructor. *Prerequisite:* Synoptic Meteorology, Dynamic Meteorology, or consent of the instructor.

OCEANOGRAPHY

5-360. General Oceanography

Fall, 2 credits RICHARD C. VETTER

A descriptive lecture course covering the characteristics of the oceans and the factors that control the distribution of properties and of plants and animals. Includes the physics, chemistry, geology and biology of the oceans. *Prerequisite:* College courses in at least two of the physical or biological sciences.

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Certified Statement of Accomplishment in Oceanography

A program leading toward a Certified Statement of Accomplishment in Oceanography has been established in cooperation with the U. S. Navy Hydrographic Office. The courses are taught in Suitland, Maryland, and are open to anyone who can meet the designated prerequisites.

The requirements for the certified statement are twenty hours of credit distributed as follows:

(1) The following required courses: (Equivalent courses taken elsewhere may be substituted.)
Physical Properties of Sea Water (2)
Mathematics for Oceanographers (2)
Geological Oceanography (2)
Biological Oceanography (2)

(2) At least six hours of credit selected from the following courses:
Practical Electronics for Oceanographers (2)
Ocean Surface Waves (2)
Dynamic Oceanography (2)
Marine Meteorology (2)

(3) The remaining six hours of credit may be selected from courses offered by the Graduate School in fields related to oceanography, such as chemistry, physics, geology, geography, mathematics, engineering, meteorology, and biology. These electives should be selected by the student in consultation with the Registrar.

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5-582. Mathematics for Oceanographers

Fall, 2 credits (alternate years) LLOYD SIMPSON

An integrated course in college algebra, trigonometry, analytic geometry, and calculus with emphasis on these topics as they apply to problems in oceanography.

[5-584.] Physical Properties of Sea Water (1957–58 and alternate years)

Spring, 2 credits (alternate years) A. WAYNE MAGNITZKY

A detailed examination of the physical principles governing the properties of sea water; a comparison of these properties with those of pure water; the definition and calculation of salinity and density; distribution of salinity, temperature, and density.

5-585. Practical Electronics for Oceanographers

Spring, 2 credits (alternate years) ROBERT FARLAND

Basic principles of electronic theory and elementary circuitry. Composition of various instrument components are demonstrated, with emphasis on methods of combining the components for specific instrumentation. Practical demonstrations and laboratory work.

5-655. Ocean Surface Waves

Spring, 2 credits (alternate years) J. J. SCHULE, JR.

The measurable properties of ocean surface waves and the methods of observing and analyzing ocean waves. The wave solution to the hydrodynamic equations is demonstrated. Discussion of the various sea surface models in-

cluding their assumptions, solutions, and practical applications; the problems of propagation of waves in a dispersive medium. Examples of the various forecasting techniques. *Prerequisite:* Calculus, or Mathematics for Oceanographers.

5-658. Geological Oceanography

Fall, 2 credits (alternate years) C. C. Bates

The topography and the composition of the ocean floor and coastal features, and the underlying causes. Emphasis is placed on dynamic processes and the deductive reasoning required to understand ocean features now being extensively observed with modern instrumentation. *Prerequisite:* Professional knowledge of oceanography or geology.

[5-662.] Marine Meteorology (1957–58 and alternate years)

Fall, 2 credits M. D. Burkhart

An introduction to the fundamental principles of marine meteorology with special emphasis upon the problems of the marine climatologist and the physical oceanographer. Topics include: descriptive and synoptic meteorology; air mass analysis; boundary processes; radiation; and climatic principles. *Prerequisite:* Professional knowledge of meteorology or oceanography.

[5-664.] Dynamic Oceanography (1957–58 and alternate years)

Fall, 2 credits J. J. Schule, Jr.

A short exposition of the principles of vector analysis precedes the main course topics. These include the development of the principles of conservation of mass and momentum; the vector equations of motion; the hydrostatic equations and the density-pressure-depth relationship; the various current equations; the principles of turbulence; the equation of mean motion; and various approaches to the problem of evaluating the eddy stress terms. *Prerequisite:* Physical Properties of Sea Water, and Mathematics for Oceanographers or its equivalent.

[5-666.] Biological Oceanography (1957–58 and alternate years)

Spring, 2 credits Max A. Proffitt

Identification and descriptive analysis of the more important flora and fauna; detailed examination of the physico-chemical principles of the nutrient and carbon-dioxide systems; distribution of flora and fauna. *Prerequisite:* Professional knowledge of oceanography or biology.

Public Administration

DEPARTMENTAL COMMITTEE

JOHN H. THURSTON (Chairman)

GLADYS L. BAKER
TONY M. BALDAUF
JAMES L. BUCKLEY
K. A. BUTLER
JOHN C. COOPER
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JOHN L. WELLS
G. E. HILBERT
MARTIN KRIESBERG
JOSEPH P. LOFTUS
WILLIAM A. MINOR
ROSS POLLOCK
ASHLEY SELLERS

The importance of public administration in the modern state is apparent. The management problems of government now require personnel with more and better training in public administration. This is true particularly in regard to the junior and assistant positions.

Many of the ablest and most experienced public administrators in the United States are in Washington. Utilizing this unexcelled talent, the Graduate School offers courses to meet the needs of the Federal service in this field.

CERTIFIED STATEMENTS OF ACCOMPLISHMENT IN PUBLIC ADMINISTRATION

COMMITTEE

GLADYS L. BAKER (Chairman)
PATTERSON FRENCH
JOHN H. THURSTON

Certified Statements of Accomplishment in Public Administration are granted to undergraduate and advanced students who complete an organized course of study in public administration intended to provide basic training for responsible administrative work.

Certified Statement of Accomplishment—Undergraduate

The program leading to the undergraduate certificate should be of special interest to:

1. Administrative assistants who wish to prepare for more responsible administrative positions.
2. Management Interns. Those who entered the service with a management option may profit from courses both more advanced and more specialized than those taken in college. Those who entered on various professional options and are now employed in such professions can profit very greatly from these courses if they expect, or wish to prepare, to enter into administrative work connected with their professional fields.

3. Persons in non-administrative specialties who expect to take on administrative duties or who wish to enter into administrative work.
4. Persons in technical fields who wish to broaden their understanding of government administration.

Requirements (48 hours of credit)

Students seeking this statement should consult with the Registrar and obtain approval of their proposed course of study early in their academic program.

1. High school diploma or equivalent. Applicants for the certificate must file a transcript of their high school or college work before completion of their certificate program.
2. Twenty-four semester hours of credit with grades of "C" or better in college level courses in the social sciences.

   Much importance is attached to general background courses in the belief that they help to broaden the thinking and understanding of the student so that he will possess a wider range of ideas and interests and sounder judgment of social values than would otherwise be the case and in consequence will be able to render government service of a higher level of value. For this reason, these requirements will not be waived.

   The following courses must be taken:

   American or European Government, or Political Science
   Principles of Economics
   American or European History
   Survey of Public Administration

   With the approval of the Registrar, credit may be given for not more than six hours of courses other than in social science which are considered to be of value in connection with work in public administration (such as writing, public speaking, statistics, accounting, or subject-matter courses related to the work of the agency in which the student is employed).

   Equivalent courses will be accepted from other institutions to meet this requirement of general background courses.
3. Twenty-four semester hours of credit with grades of "C" or better in undergraduate and graduate courses in public administration, excluding all accounting courses except Internal Auditing. The twenty-four credit hours are to be distributed as follows:

a. A minimum of six credits from the Division of Organization and Management.

b. The remaining eighteen credits may be selected from the Divisions of General Administration, Financial and Budgetary Administration, Legal Administration, Procurement and Property Management, or additional courses in Organization and Management. Students are advised to include in their programs at least one course from each Division.

c. Upon prior approval of the Registrar, credit for courses outside the Department of Public Administration (including not more than two courses in office techniques and operations) may be applied when such courses are properly in line with the student's major interest.

d. When the student has completed the social science requirements and fifteen hours in public administration, he should review his course of study with the Registrar.

Certified Statement of Accomplishment in Management—Advanced

This certificate is granted to students who complete an organized course of study intended to provide advanced training in management. The program should be of interest not only to persons who are responsible for management of operating programs but also to those in specialized fields of management who wish to add perspective to their work, to persons who wish to prepare for more responsible administrative positions, and to scientific, technical, and professional people who have or expect to have administrative responsibilities. The requirements have been established with the aim of assuring the students a broad coverage of the major areas of administration.

Requirements (20 hours of credit)

Students seeking this certificate should consult with the Registrar and obtain approval of their proposed course of study early in their academic program.

1. Government experience at the level of GS-9 or above, or a Bachelor's degree, or a Certified Statement of Accomplishment in Public Administration.
2. Twenty semester hours with grades of "B" or better in courses distributed as follows:

   a. A minimum of fifteen semester hours selected from the following:

Principles and Applications of Scientific Management (3)
Techniques of Organization (3)
Human Relations in Administration (3)
Budgetary and Financial Administration (2)
Organizing and Administering a Personnel Development Program (3)
Conference Methods Workshop (2)
Legislative Process (Proposed)
Government Public Relations (Proposed)
Executive Leadership in Public Administration (Proposed)
Readings and Papers in Public Administration (3) or (6)

b. The remaining semester hours shall be selected from courses numbered 500 or above in public administration or, with the approval of the Registrar, in other social sciences.

c. When a student has completed twelve hours in public administration courses, he should notify the Registrar so that he may be assigned to an advisor.

Certified Statements of Accomplishment with Honors

Students who complete the requirements for the Certified Statement of Accomplishment in Public Administration (undergraduate) or the Certified Statement in Management (advanced) with an average of "B" or higher may qualify for honors by passing an oral examination. The examination is given by a panel set up by the Graduate School. Students who wish to take the examination should apply to the Registrar at the completion of their programs.

General Administration

COMMITTEE

Martin Kriesberg (Chairman)
Gladys L. Baker — O. B. Conaway, Jr.
A. J. Nichols

These courses offer a general understanding of American government and the fundamentals of public administration. In them a special emphasis is placed on the relationships of citizens and public employees.

A student who plans to take work in any of the divisions of the department will find that the specialized courses are more meaningful and useful if he has first completed the basic courses in this Division.

6-341. American National Government

Fall, 2 credits. Repeated in Spring — SALVATORE NERBOSO

History and origins of the national Government of the United States; the political process—parties and elections; the legislative process; the functions of the national Government and their administration; courts and judicial review of legislation.

6-344. Survey of Public Administration

Fall, 3 credits — CARL F. STOVER

This is a survey course designed to introduce the student to the elements of public administration and to lay a foundation for further study and practice in the field. Topics considered are: the evolution of administrative organization; organizational types: staff, line, and auxiliary agencies and functions; controls of administration; the broadest aspects of personnel selection, classification, training, movement, and relations; budgeting and fiscal control; federal-state relations; administrative legislation and adjudication.

6-346. Conference Methods Workshop

Fall, 2 credits. Repeated in Spring — L. K. WRIGHT and C. O. HENDERSON

Designed for persons who desire to prepare for leadership responsibilities in planning, conducting, or participating in meetings of any kind, and especially those of an official nature. The class is conducted by means of demonstration, lecture, participation practice meetings, analysis, and evaluation. Topics include types of meetings, agenda, arrangements, use of visual aids, order of business, chairmanship, committees, fundamental parliamentary procedure, guiding principles, objectives, organizing and presenting reports, introductions, reaching decisions, and summarizing.

6-400. Administrative Operations for Congressional Assistants

Spring, 2 credits (alternate years) — JEROME N. ELLER

This course deals with the practical administrative problems encountered by secretaries and other staff assistants to U. S. Senators and Congressmen. Such matters as the following are considered: organization of office routine; preparation and distribution of newsletters and publicity releases; special services available to members of Congress; the use of Senate and House Documents and reports; relations with the Executive departments; pressure groups; relations with constituents; the practical workings of Congress; assistance with legislative matters.

6-453. Human Relations in Administration

Fall, 3 credits — E. GRANT YOUMANS

Designed to develop the student's understanding of and insight into interpersonal relationships in large-scale organizations. Includes: value orientations in administration; formal and informal organization; pathologies in administration; status and role; power and authority; styles of leadership; authoritarian and democratic administrators; career dynamics; psychological stress in administration; motivation and morale.

6-454. Applied Human Relations in Administration

Spring, 2 credits — E. GRANT YOUMANS

A laboratory course designed to give students practice in applying principles of human relations in administration. Includes: diagnoses of social processes in administration; skills of effective performance in face-to-face situations; formu-

lation and assignment of administrative objectives; creating appropriate social climate; leadership skills; utilizing member resources; irrational factors in administration; decision-making processes. *Prerequisite:* Course 6-453 or consent of instructor.

6-587. Contemporary Trends in Public Administration

Spring, 3 credits — Carl F. Stover

This course is designed for the person who has had some experience or training in administration. It gives attention to important areas in the analysis of governmental administration, such as the development of a theory of organization, policy and administration, decision-making, executive leadership, and the application of scientific analysis to administrative problems. The objects of the course are to deepen the student's insight into administrative operations, to broaden his understanding of administration in a democratic society, and to introduce him to materials in new areas of inquiry. The course is taught primarily through the intensive discussion and analysis of readings, drawn from the writings of such persons as Chester I. Barnard, Alex Bavelas, Leon Festinger, Harold Lasswell, Alexander Leighton, Kurt Lewin, Wayne A. R. Leys, Karl Mannheim, Robert Merton, C. Wright Mills, David Reisman, Philip Selznick, Herbert Simon, Harold Stein, and Max Weber. Registration is subject to the approval of the instructor.

6-600. Readings and Papers in Public Administration

Fall, 3 credits. Repeated in Spring — John H. Thurston, Coordinator

Under the guidance of a senior administrative official, supervised readings with monthly conferences on specified topics of administration or individual research and a paper on some problem or phase of administration. Readings or problem to be investigated are determined in consultation with adviser. *Prerequisite:* Completion of all other requirements for the undergraduate or graduate certified statement of accomplishment in public administration. The course may be taken, with the approval of the coordinator of the course, by students who are not candidates for certified statements if they have the equivalent background in public administration.

Organization and Management

COMMITTEE

Joseph P. Loftus (Chairman)

N. Robert Bear
Harvey E. Becknell
William A. Gill
Edward W. Harding
Mark M. Kirkham
Arthur Jebens
Harold A. Stone
Ben M. Williams

These courses are offered to give students an opportunity for progressive study and advancement in the general field of organization and management. The courses use to advantage, among other background data, the instructional and case materials developed by the Bureau of the Budget and by other Governmental agencies.

6-405. Principles and Techniques of O & M Work

Year, 2 credits each semester — Richard F. Cook

Deals with the principles and techniques employed in surveying and analyzing organization and methods problems and in formulating solutions to such

problems. Emphasis on planning and conducting procedures surveys; methods and approaches in analyzing and planning organization structures including analysis of the impact of individual and group behavior on formal organization structures and authority; methods of dividing work (production planning) and controlling work (production control); relationship of the scientific method to O and M work; analysis of staff and line concepts and relationships including the problem of overcoming resistance to new methods and procedures. *Prerequisite:* Experience in O&M work.

6-410. Management of Procedures and Correspondence Systems

Fall, 2 credits — Dan F. Moser

A survey of the purposes, objectives, and problems of managing formal, internal communications systems, and an intensive study of systems for the orderly dissemination of official written material. Emphasis is on planning, developing, installing, operating, analyzing, and evaluating such systems, and their contribution to agency management and operation. The course includes subjects previously covered by courses on directives systems and correspondence management.

6-412. Reports and Forms Management

Fall, 2 credits. Repeated in Spring — Edward J. Lewis and William B. Rice

Designed to provide students with a comprehensive knowledge of forms and reports management systems and how to operate them. A study of: various systems used for controlling forms and reports; different techniques used in Government for forms design and format; standards and printing specifications; methods for analyzing forms and reports; and how to install and operate forms and reports management programs. Analysis of forms and reports by case studies with group discussion of techniques involved. Special lectures by top technicians from representative Government departments.

6-450. Principles and Applications of Scientific Management in Public Enterprise

Fall, 3 credits — Joseph P. Loftus and Philip C. Ward

Common functional elements of management. Definition of objective; organization; planning; coordination of execution through schedules, budgets, reports, and measurement of progress. Types of motivation. Historic management types. Types of organization. Personal relations and community relations in the several management types. Origin, nature and development of scientific management. Application of scientific management in enterprises inside and outside of government. *Prerequisite:* Bachelor's degree; or a course in American government or public administration and a course in social science.

6-519. Work Standards and Work Measurement

Fall, 2 credits. Repeated in Spring
Wilfred S. Williams and Sidney Schneider

A study of the most advanced techniques of scientific management concerned with development of work standards and measurement of work loads and performance, and of their adaptability in public administration. Statistical and experimental methods of determining standards. Dangers to avoid in setting standards. Time study. Standards as a dynamic part of operations, and a tool in developing policies on personnel placement and training. Standards as aids in developing budgets, in planning operations, and in individual work planning.

Relationship of standards of performance to those of costs and quality. Importance of dependable standards, measurement and appraisal of performance to summary statements of progress for the use of higher administrative officials. *Prerequisite:* Practical working experience at Grade GS-7 or above, or permission of instructors.

6-550. Techniques of Organization

Spring, 3 credits — PERRY R. TAYLOR

Organization of public and private agencies. Brief historical review of organization, including church, military, and modern industry. The division of work. Delegating responsibility. Span of control and unity of command. The staff assistant and staff specialist. Group decision-making. Decentralization and the problems of coordination when geographically dispersed. Process of reorganization including timing, developing and putting into effect. The organization chart and manual. Case studies. *Prerequisite:* A course in public administration, scientific management, or O&M analysis.

FINANCIAL AND BUDGETARY ADMINISTRATION

COMMITTEE

JOHN L. WELLS (Chairman)

CHARLES L. GRANT — DAVID H. SPANIER
FRED A. MCNAMARA — FRANK H. SPENCER

Students desiring a knowledge of how the Government obtains, budgets and manages its money will find helpful some of the courses in general administration as well as the specialized courses in this division. Those with limited experience in this field should begin their study with Federal Budgetary Procedure in the Division of Office Techniques and Operations, and the general administration courses before attempting the advanced course in Budgetary Administration.

The course in hospital administration is designed for persons who are engaged in hospital or health administration in either private or government agencies.

6-525. Financial Organization and Procedures of the Federal Government

Fall, 2 credits (alternate years) — CARL W. TILLER

A comprehensive summary presentation of Federal fiscal administration, presented primarily on a lecture basis, and including review of the roles of major participants: Treasury, GAO, Congressional Committees, Bureau of the Budget, and operating departments. Designed to provide an understanding of the financial organization and procedure of the Federal Government, including its fund and account structure, methods of financial control, the use of financial reports, and related subjects. An orientation course for persons working in some part of the area of financial administration, such as budgeting or accounting, and for general or program administrators who wish an overall picture of the financial structure of the Government.

6-635. Budgetary and Financial Administration

Fall, 2 credits — Joseph C. Wheeler

This is an advanced, one-semester course for experienced budget and administrative personnel. Covers the broad phases of budgetary and financial administration in the Federal Government primarily from the standpoint of the operating departments. Emphasizes the role of budget formulation and execution in the relationships between the legislative and executive branches of the Government and among the staff operating agencies within the executive branch. The first half of the course deals with the pre-appropriation phases of budgeting, including formulation, review, and congressional enactment of the budget. Topics discussed include: the role of budgeting in program formulation; the role of bureaus, departments, Bureau of the Budget, the President and Congress in budgeting; content of the budget and of departmental estimates and related budgetary materials. The second half of the course deals with the execution of the budget after it is enacted by Congress and the relationships of administrative planning and control, accounting, auditing, and financial reporting to budget execution. *Prerequisite:* Bachelor's degree and an introductory course in public administration; or experience at a responsible level in budgetary, financial or general administration; or consent of instructor.

6-461. Hospital Administration

Year, 4 credits — Fred A. McNamara and Pierre S. Palmer

A course designed for those desiring to acquire a broad knowledge of the field of hospital administration. The first semester deals with the history of hospitals; the scope and organization of voluntary and Federal hospital programs; general principles of organization as applied to both Federal and voluntary hospitals; the functional elements of hospitals; and application of modern management tools in hospital administration. The second semester deals with additional examples of the application of modern management tools in hospital administration; control of quality of professional care of patients; management problems in such areas of hospital administration as food service, supply management, and length of patient stay; and problems of coordination of Federal hospital operating and construction programs.

The course is conducted through lectures and discussion periods. Guest speakers from Federal and voluntary hospitals present several of the topics. Credit is given only upon completion of both semesters and registration is limited to those planning to take both semesters. *Prerequisite:* Familiarity with hospital operations.

Personnel Administration

COMMITTEE

James L. Buckley (Chairman)
C. O. Henderson (Vice-chairman) — William T. McDonald
Henry F. Hubbard — James C. O'Brien
Harold Leich — Ross Pollock
John M. Watts

The student is urged to take the introductory course in public administration before concentrating on the program in this division. Unless substantial experience can be substituted, the general course, Public Personnel Administration, should be taken before the specialized courses (such as Position Classification, Selection and

Placement, etc.). Persons who are in positions classified at GS-5 or below and desire to prepare for personnel work should begin with Federal Personnel Procedure in the Department of Office Techniques and Operations. They should not attempt to take the specialized courses until they have gained substantial experience in personnel work or have completed all basic, general courses.

6-430. Public Personnel Administration

Fall, 2 credits. Repeated in Spring — Jerry C. Doster

Designed for supervisors and administrators wishing to have general familiarity with personnel work, for those in junior personnel staff positions desiring a broad understanding of personnel administration, and for those desiring to enter the field who need a foundation for the more specialized courses in the personnel field. Personnel problems which arise when people are associated together in a work situation; basic personnel policies and practices necessary and useful in treating personnel problems; differences between responsibilities, with respect to personnel administration, of the supervisor and the personnel officer; the various phases of personnel work; study of merit system and forms of organization; civil service legislation at various governmental levels; relationships between the Civil Service Commission and operating agencies and personnel offices of latter; trends in public personnel administration and its relationship to overall management.

6-444. Position Classification

Fall, 2 credits. Repeated in Spring

William C. Laxton and Joseph P. Findlay

Covers the fundamental concept of position classification and its uses; relation of classification to compensation and other phases of personnel management; analysis of Classification Act of 1949; identification, analysis and application to specific positions of factors determining class and grade levels; discussion of job evaluation techniques; and application of position classification in the Federal service including operating policies, practices and procedures. *Prerequisite:* One of the following: Courses 344 or 430 in Public Administration; Grade GS-4 or above in personnel work; 60 semester hours of college work.

6-448. Wage Administration

Fall, 2 credits — William F. Sorensen, Jr.

Purposes, principles and methods of wage administration, with primary emphasis on compensation plans for trade, craft, and labor occupations. Study and discussion of various concepts and methods currently used in government and industry, including job analysis, job evaluation, labor market analysis, wage surveys, schedule construction, and within-grade advancement plans. *Prerequisite:* One of the following: Course 6-444, or experience in position classification and/or wage administration work.

6-458. Advanced Wage Administration

Spring, 2 credits — William F. Sorensen, Jr.

Problems in administering wage programs; compensation of supervisors; pay relationships among white and blue collar positions; incentive systems; the role of line management in wage programs; coordination of wage programs; labor relations aspects of pay fixing. *Prerequisite:* One of the following: Course 6-448 or experience in wage administration work.

6-512. Employment and Placement

Spring, 2 credits — Milton M. Mandell

Use of tests, selection, interviewing, promotion systems, assignments, transfers, and methods to insure the proper utilization of personnel. Selection and placement for engineering, managerial, and office jobs. Class discussion determined by specific student interests.

6-518. Organizing and Administering a Personnel Development Program

Fall, 3 credits — William Oncken, Jr.

Personnel training and development as a line responsibility. Determining needs for training and development, organizing for training, evaluation of training at all levels in the organization. Consideration of the role of the line organization in carrying on management development, executive development, and scientific, professional, and technical training. The role of top management in exercising its responsibility for developing the work force. Examination of new developments in training in the Federal Government, including proposed legislation, and consideration of the effects of these developments on the responsibilities of persons responsible for training policy and programs. Examination and evaluation of the experiences of governmental agencies and private industrial organizations in this field. The course is designed for (1) operating officials who influence the training policies and practices of their agencies through membership on training and development committees, panels, and boards, and (2) staff officials who have agency-wide staff responsibilities for training and development. Persons who anticipate moving into either of these two roles in the near future also are eligible.

Legal Administration

COMMITTEE

Ashley Sellers (Chairman)

Thomas J. Flavin — Ralph F. Koebel

David Reich

6-320. Introduction to Administrative Law and Procedure

Fall, 2 credits — Edward C. Johnson

A survey, for the general student, of the nature of administrative law, its subject matter, and methods of administration. The rule-making and adjudicative or determining procedures by federal and state regulatory agencies and the remedies against administrative action receive special consideration.

The increased complexity of modern society has meant that administrative tribunals have played an expanding role in the regulation of life and property. This course includes a study of the law which controls and the regulations which are made by governmental officers to implement that law. A survey of economic and social forces involved in regulatory action. Material used includes regulations, orders and decisions of federal, as well as state and municipal bodies, which acquaints students with current developments in administrative law and procedure. Topics covered include: powers and duties of administrative authorities as they relate to the supervision of public, as well as private interests; means of enforcing decision; remedies against official action; legal qualifications for office; legal disqualification of officers; appointment, tenure, removal and compensation of officers; and related matters.

6-422. Business Law

Year, 2 credits each semester — Edward C. Johnson

Aspects of law essential to the conduct of modern business. Forms of business organization, bailments, property, sales, mortgages, negotiable instruments,

contracts. This course is so arranged that students may attend both semesters or either semester. No subject matter, however, will be repeated.

6-425. Legal Aspects of Investigation—Criminal Evidence and Procedure

Spring, 2 credits — Ralph F. Koebel

Designed to provide investigative personnel and those desiring to prepare for such work, a background and insight into the legal aspects of their investigations: what types of evidence to seek; circumstances and conditions under which the evidence is to be obtained in order to have adequate probative value; and how to prepare such evidence for presentation in court or other procedure. Since all investigations are potential sources of prosecution, the requirements of criminal evidence and procedure often reach into the early stages of investigation. The instruction is designed to provide understandable information without overemphasis of technical aspects.

8-602. Public Utility Law (*See* p. 88)

Procurement and Property Management

COMMITTEE

Tony M. Baldauf (Chairman)

Courses in this field deal with how the Government purchases, manages and accounts for materials and supplies. Those interested in purchasing but with limited experience in such work will find it helpful to begin with the courses in Federal Purchasing Procedure and Federal Property Procedure before attempting the management courses.

Selected background courses in public administration together with courses in the Division of Organization and Management will provide a thorough training in administration in this area.

6-367. Federal Contracting

Spring, 2 credits — Tony M. Baldauf

A course devoted to contracting as a technique of purchasing where advertising is required, including the study of legal and administrative policy background of contract provisions, requirements of advertising, analysis of bids, contract award and administration, the handling of disputes, appeals, protests, change orders, amendments, construction contract procedures, debarment procedures, and related subjects. The practical application of these requirements by preparation of bids, contracts, orders, and related matters.

6-455. Management of Government Supply

Fall, 2 credits — Tony M. Baldauf

An advanced course to be presented by lectures by various experts in the supply field, on legal background, organization of agency supply operations, stores management, standards, motor vehicle management, survey techniques, control, distribution, and other staff and operating phases of supply management.

6-638. Government Defense Contracts

Fall, 2 credits — Julius Silverstein

Laws and problems in defense contracting by the Federal Government, including such subjects as cost-plus contracts, contingent fees, priorities, subcontracting, escalation, financing, renegotiation, contract termination, and surplus property.

8-405. Principles of Specifications (*See* p. 86)

8-420. Fundamentals of Standardization (*See* p. 87)

Accounting

COMMITTEE

John C. Cooper (Chairman)

Paul L. Appleman — Warner H. Hord
Karney A. Brasfield — Charles N. Mason
Robert H. Fuchs — Robert W. Maxwell
Herschel C. Walling

The Graduate School offers accounting courses primarily as a means of training for the *public* service. The curriculum necessarily includes courses in general accounting because the basic principles are essential for Government accounting.

Certified Statement of Accomplishment in Accounting

The scope of accounting in the Federal service is wide. There are increasing demands for accountants having a knowledge of commercial as well as Government accounting. These demands have come as a result of the formation of many Government corporations and Federal regulatory agencies, and the development of the Joint Program to Improve Accounting in the Federal Government. The Joint Program is a Government-wide cooperative effort under the joint leadership of the Comptroller General of the United States, the Secretary of the Treasury, and the Director of the Bureau of the Budget, to make accounting of maximum usefulness to all concerned. Its purpose is to give the President better management in the executive branch, the Congress better information for acting upon appropriations and other legislation, and the public a clearer picture of the financial condition and operations of the Federal Government. Hence, the accounting program required for a Certified Statement of Accomplishment is broad enough to cover not only the regular appropriation accounting of the Federal Government, but also the accounting training needed for many other governmental activities. The program is comprehensive enough both to provide advanced training for the

Government service, and also, if courses are carefully selected, to meet the usual educational requirements for C.P.A. examinations. Students planning to take C.P.A. examinations should know the requirements of the state in which they plan to take the examination. In general, their study, in addition to accounting, should include the following: Principles of Economics, Corporation Finance, Investments, Mathematics of Accounting and Investment, Business Law, Statistics, Business English, Principles of Marketing and Industrial Management.

Requirements for Certified Statement

1. High school diploma or equivalent.
2. Thirty-six semester hours of credit with grades of "C" or better in courses outlined below and distributed as follows:
   a. All of the required courses.
   b. No less than three semester hours credit from the Accounting Elective Courses.
   c. No less than six semester hours credit from the Related Elective Courses.
   d. The remaining semester hours credit may be taken in either of the two elective groups.

REQUIRED COURSES

Courses	*Number of Semesters*	*Semester Hours Credit*
Principles of Accounting	2	6
Intermediate Accounting	2	6
Cost Accounting	1	3
Auditing	2	4
Advanced Accounting	2	6

ACCOUNTING ELECTIVE COURSES

Elementary Federal Government Accounting	1	3
Advanced Federal Government Accounting	1	3
Federal Income Taxes	1	3
Analysis and Interpretation of Financial Statements	1	2
Mathematics of Accounting and Investment	1	3
Budgetary Administration	1	2
Accounting Systems	1	2
Cost Accounting (Second Semester)	1	3

RELATED ELECTIVE COURSES

Financial Organization and Procedures of the Federal Government	1	2
Internal Auditing	1	2
Business Law	2	4
Principles of Economics	2	6
Principles of Statistical Analysis	2	6
Writing Procedures and Instructions	1	2
or Introduction to Official Writing	1	2

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6-352[a]. Principles of Accounting—First Half

Fall, 3 credits. Repeated in Spring and Summer

HERBERT G. MARSHALL
WILLIAM H. ROWE
STANCIL M. SMITH
PAUL S. CARTER

Elementary principles of accounting; discussion and problems. At the end of the semester students will be prepared to do the accounting necessary for a small business organization; i.e., keep a complete set of books, draw up statements at the end of the fiscal period, adjust the accounts for accruals, deferred items, depreciation, etc., and close the books. *Prerequisite:* High school graduation or equivalent.

6-352[b]. Principles of Accounting—Second Half

Spring, 3 credits. Repeated in Summer and Fall

HERBERT G. MARSHALL
WILLIAM H. ROWE
STANCIL M. SMITH
PAUL S. CARTER

Continuation of first half covering more advanced principles of accounting; accounting for partnerships, corporations and manufacturing; depreciation policies and analysis of financial statements. *Prerequisite:* First half or equivalent.

6-353[a]. Intermediate Accounting—First Half

Fall, 3 credits

WARNER H. HORD
CLARK L. SIMPSON

Advanced principles of manufacturing accounting, corporation accounting, and valuation as applied to current assets, fixed assets, intangibles, and liabilities, reserves and funds, installment sales. *Prerequisite:* A first year course in accounting.

6-353[b]. Intermediate Accounting—Second Half

Spring, 3 credits

WARNER H. HORD
CLARK L. SIMPSON

Advanced principles of partnership accounting, including formation, operation, and dissolution; joint ventures; consignments; agencies and branches; application of funds. *Prerequisite:* First half or equivalent.

6-264. Elementary Federal Government Accounting

Fall,3 credits. Repeated in Spring

CHARLES I. JENKINS

Discussion of basic accounting documents and explanation of, discussion on, and practice work with the basic ledgers (allotment ledger, objective classification ledger, and general ledger) maintained in connection with funds made available to Federal agencies. Related procedures and General Accounting Office regulations are explained and discussed. Appropriation, apportionment, allotment, disbursement, collection, and reporting processes are discussed and the relationship between administrative accounts and accounts kept by the Treasury are explained. Designed for accounting clerks, and for those who have had commercial accounting training or experience and wish to become acquainted with Government accounting.

6-354. Advanced Federal Government Accounting

Fall, 3 credits. Repeated in Spring

CHARLES N. MASON

A review of the development of the accounting system for Federal funds and the present financial organization in which the accounting is performed with attention to the accounting responsibilities of each segment of the organization, including the Treasury Department and the General Accounting Office. Detailed study is given to the accounting problems of administrative agencies with

special emphasis on the principles of controls and recent developments in accounting in the Federal government. *Prerequisite:* Intermediate Accounting, or Principles of Accounting and Elementary Federal Government Accounting.

6-420. Advanced Accounting—Theory and Problems

Year, 3 credits each semester — Laurence W. Acker

A comprehensive study of advanced principles of accounting together with their application to specific problems. Special consideration is given to consolidated statements; foreign exchange; receivership; estates and trusts; public accounts. Emphasis is placed on problems in accounting theory and practice such as are generally given in C.P.A. examinations. *Prerequisite:* Intermediate Accounting.

6-423. Mathematics of Accounting and Investment

Spring, 3 credits — Ralph R. Botts

Calculation of compound interest, compound discount, amount and present value of annuities, including perpetuities and capitalization methods of determining valuation. Special attention given to accumulation of sinking funds and the amortization of debts by equal payments, with applications to open-end mortgages. Also covers yield and valuation of bonds, various depreciation methods, and exact and approximate methods of determining interest rates charged on time purchases and small loans. Some attention given to life probabilities and the calculation of premiums and cash values for the more common types of life insurance and annuities. Accounting applications and entries are discussed upon request.

6-510. Analysis and Interpretation of Financial Statements

Spring, 2 credits (alternate years) — Herschel C. Walling

Study of the flow or movement of funds as reflected in the financial statements. Use of ratios and other indices in the analysis and interpretation of financial position together with a consideration of trends and variations therein. Subject matter is developed through lectures and problems, supplemented with published financial statements. Each student prepares, under supervision of the instructor, an analysis of the current financial statements of some prominent corporation together with a comparison with the principal competitors in the field. *Prerequisite:* Intermediate Accounting.

6-525. Financial Organization and Procedures of the Federal Government

(*See* p. 63)

6-642. Cost Accounting

Year, 3 credits each semester (alternate years) — James H. Lobb, Harry W. Rice

A thorough and comprehensive treatment of the principles of cost accounting, together with the methods of their application to specific problems. By means of lectures, textbook study, and problems, full consideration is given to the methods of cost accounting for materials, labor, direct and indirect expenses in their relationship to specific job orders; process, departmental and standard costs; and the control accounts. *Prerequisite:* Principles of Accounting.

6-645. Federal Income Taxes

Fall, 3 credits — Eugene C. Moyer

Principles of federal income taxation applied to individuals, partnerships and corporations for determination of gross income, deductions credits and exemptions. Forms of various tax returns; application of principles of accounting.

6-684. Internal Auditing

Fall, 2 credits (alternate years) JOHN C. COOPER

This course is new in the Graduate School's curriculum and is intended to provide a comprehensive understanding of the philosophy and purpose of internal audit. Primary emphasis is placed on the use of this function as an aid to management and operating officials. This course reflects the current concept that internal auditing is an important management control which functions by review and appraisal of other management controls, and, accordingly, (1) reviews and appraises the adequacy of policies, plans, and procedures, (2) ascertains compliance with policies, plans, procedures, regulations, and laws, (3) ascertains whether agency assets are properly safeguarded and accounted for, and (4) ascertains the degree of reliability of accounting and supporting statistical data. Placement of the internal audit function in the organization, its relationship to line operations and line inspections, and its relationship to external audits are described. Staffing and organization of an internal audit unit, planning of audits, techniques for performance of audits, audit manuals, and reports are covered with illustrations from actual situations. The establishment and effective utilization of the internal audit function in connection with Government operations receives special attention. *Prerequisite:* Experience in internal audit, administrative or management analysis, O&M work, advanced accounting, auditing or other similar activities.

[6-693.] Auditing (1957–58 and alternate years)

Year, 2 credits each semester JOHN C. COOPER

The fall semester is devoted to the study of the fundamental principles of public or commercial-type audits. Consideration is given to the purposes and types of audits; the responsibility of the auditor; planning and performing audits. Special emphasis is placed on problems in audit theory and practice such as are generally given in C.P.A. examinations.

In the spring semester, emphasis is placed on case studies in auditing and the application of audit principles. *Prerequisite:* Intermediate Accounting.

6-694. Specialized Federal Accounting Systems

Fall, 3 credits (alternate years) EDWIN T. NOLAN and SPECIALISTS

Designed to acquaint the students with the basic principles and standards for accounting in the Federal Government as promulgated by the Comptroller General, the reporting requirements of the Bureau of the Budget and Treasury Department and the development of improved systems by individual agencies within the over-all guidance. In addition to consideration of Government-wide developments, the systems of a diversified group of Federal agencies are used as case studies. *Prerequisite:* Intermediate Accounting, Federal Government Accounting, and Cost Accounting, or the equivalent.

6-695. Accounting Systems

Spring, 2 credits (alternate years) EDWIN T. NOLAN

Classification of accounts. Planning, designing, and installation of accounting systems. Problems of management. Organization and correlation of the accounting department with other departments. Illustrative systems, showing forms and procedures for specific types of business, including financial institutions, insurance, department store, public utilities and Government.

Social Sciences

DEPARTMENTAL COMMITTEE

Bushrod W. Allin (Chairman)

Mary L. Collings
H. Duncan Hall
Sherman E. Johnson
Paul E. Nystrom
Harold B. Rowe
Conrad F. Taeuber
Carl C. Taylor
James E. Thigpen
Harry C. Trelogan (Vice-chairman)
Frederick V. Waugh
Bennett S. White

Purpose and Scope

Social science deals with people and the problems of human relationships, as contrasted with natural or physical science which deals with things and the problems arising out of physical relationships.

The problems of social organization and operation have become both absolutely and relatively more important with the increase in complexity of our industrial civilization. More and more, people are concerned with the organization of production, the distribution of goods and income, and with price policies. The individual as a consumer and investor, the businessman and the farmer as producers, find increasing need for a knowledge of economics and other social sciences. Large corporations are employing growing numbers of economists to help in the formulation of policy. Psychologists and social workers are finding a demand for their services in personnel work. And, the large number of Federal, state and local government agencies need more people adequately trained in social science.

Social science is divided into a number of closely allied fields including economics, sociology, political science, history, law, and psychology. A broad grasp of any one of these subjects implies at least some familiarity with the others, because of the many interrelationships among these studies. Yet the continued development of each social science has given rise to larger and still larger bodies of knowledge relating to it, until only through a considerable degree of specialization can the student hope to master any one part. Thus the great need is for people who have concentrated sufficiently on one phase of a social science, such as marketing in economics, to be thoroughly familiar with the details of fact and principles involved, yet who also have a broad underlying training in the allied fields.

The courses offered by the Graduate School are designed to aid in acquiring a general background in the social sciences, as well as the specialized training in particular fields which is necessary for

successful work in many Government departments and in private business.

General Economics

COMMITTEE

Bushrod W. Allin (Chairman)

James P. Cavin — Frederick D. Stocker
Nathan M. Koffsky — William A. Vogely
Clayton E. Whipple

Adequate foundation training in general economics is essential for satisfactory accomplishment in the study of any specialized branch of the subject. Hence, the primary objective in developing the following list of courses has been that of providing the basic work needed, by students who wish to carry out a systematic plan of study, at both undergraduate and graduate levels.

7-135. Family Finance

Fall, 2 credits — Harold B. Rowe

Family financial organization and management presented in terms of major decisions to be made during the life of a family and having to do with what, when, and how to own and to owe. The approach represents an experiment in applying modern economic concepts in a non-technical analysis of the situation of the family viewed as the primary unit of ownership and economic organization. Emphasis is placed upon the futurity and uncertainty of objectives and expectations; the importance of joint relationships in the asset and liability position of the family; and the interdependence of financial decisions. Attention is given to saving and investment, insurance, education of children, home ownership, retirement and other similarly important aspects of managing personal finances.

7-201. Principles of Economics

Year, 3 credits each semester — Frederick D. Stocker

A survey course designed to familiarize the student with the basic tools of economic analysis. Emphasis is given to the application of economic principles to policy questions, both of current and continuing importance. Among the topics covered are (1) production, income, and the creation of wealth; (2) business organization and finance; (3) money and the banking system; (4) control of business fluctuations; (5) international trade; and (6) the distribution of income. While it is advisable that students registering for the second semester have completed the first semester, qualified students may be admitted at midyear.

7-480. Money and Banking

Year, 2 credits each semester (alternate years) — Instructor to be announced

The principles of money. The value of money. Effects of changing price levels. Money, credit, and capital. Significance of the rate of interest. Fundamentals of monetary policy. Evolution of the banking system. The money-market. Principles of central banking. The Federal Reserve System. Quantitative and qualitative credit control. Banks and the creation of credit. Effects of the war on the banking system. Inflation and deflation. International monetary standards. International monetary relations. *Prerequisite:* Principles of Economics or the equivalent.

[7-481.] Economic Fluctuations and Forecasting (1957–58 and alternate years)

Fall, 2 credits — Nathan M. Koffsky

National income analysis as a tool for forecasting economic fluctuations. The meaning of the Income and Product accounts and the data that underlie them. The impact of changes in spending by consumers, business, and government on the total economy. The data which give clues to such changes, such as the Federal Budget, business investment plans, and consumer behavior. The national product "gap" analyses as a tool in measuring the direction and extent of changes in economic activity. Brief review of business cycle theory and measurement, including the Historical School and the work of the National Bureau of Economic Research. Analysis of the President's Economic Report. Long-term projections of economic growth. *Prerequisite:* A course in elementary economics and a course in statistics.

7-483. Fiscal Policy

Spring, 2 credits — Frederick D. Stocker

Governmental finances, particularly as they affect the gross national product and employment. Basic assumptions, values, and priorities in a full employment fiscal policy. Economic implications of various taxing, spending, and debt policies, and the relationship of fiscal to monetary measures. The problem of inflation and depression. Primary emphasis is on Federal finances, but the role of State and local financial policies is also discussed. *Prerequisite:* A basic course in economics.

7-528. International Trade and Commercial Policy

Fall, 3 credits — William A. Vogely

The course is oriented toward an understanding of the role of international trade in the United States economy. A survey of the theory of comparative costs and international values forms the foundation for investigation of specific commercial policy problems. Balance of payments, exchange rates, tariffs, customs unions, and other problem areas are analyzed in the light of their effects on national income, employment, and national security. The institutional structure, including the Reciprocal Trade Agreements Act, the General Agreement on Tariffs and Trade, the International Monetary Fund, and the proposals of the Havana Charter, and empirical data on the pattern of world trade are stressed throughout. The course provides an overall view of the theory and practice of United States commercial policy. *Prerequisite:* Consent of instructor.

7-548. Economic Analysis

Year, 3 credits each semester — William A. Vogely

The course is concerned with methods of economic analysis. Emphasis is placed upon the exposition and evaluation of theoretical models explaining the relationships among various sectors of the economic system. Empirical applications of these tools of analysis are studied. The first semester is primarily concerned with analyses of the behavior of firms, households, and industries. The theories of demand, production, distribution, and price are studied intensively, including systems of both partial and general interdependence. The second semester is primarily concerned with analyses of the behavior of economic aggregates. The theories of employment, national income, and economic development are studied, with particular attention to the contributions initiated by Lord Keynes. *Prerequisite:* A course in the principles of economics.

7-560. Modern Economic Thought

Spring, 3 credits (alternate years) BUSHROD W. ALLIN and JAMES P. CAVIN

A review of the ideas of the leading economic theorists of the past fifty years, including those of Marshall, Veblen, Commons, Mitchell, and Keynes. The purpose of the course is to help the student understand the relevance of the principal contributions of these men in dealing with the economic problems of the American economy.

7-570. Statistical Analysis Applied to Economic Problems

Year, 2 credits each semester (alternate years) RICHARD J. FOOTE

The first semester deals mainly with analytical tools for measuring demand, using the single-equation approach. Emphasis is placed on the cases for which single equations appear to be valid, the statistical requirements that must be met if the method of least-squares is to be used, other statistical considerations involved in setting up the analysis, and the interpretation of results. The first half of the second semester is devoted to an introduction to the use of simultaneous equations in demand analysis, with application to the analysis of relations between competing and complementary commodities. Other topics depend on the interest of students: they might include spatial-equilibrium analysis and linear programming, endogenous mechanisms and the cob-web theorem, analysis of family budget data, sector analysis, or methods of studying effects of alternative government programs. *Prerequisite:* Principles of Economics, a course in statistics which included multiple regression analysis, and a working knowledge of elementary algebra.

AGRICULTURAL ECONOMICS

COMMITTEE

BENNETT S. WHITE (Chairman)

PHILIP F. AYLESWORTH
FLOYD E. DAVIS
HORACE R. JOSEPHSON
H. M. SOUTHWORTH
ROBERT M. WALSH
EVERETT C. WEITZELL

The great importance of enlarging and improving knowledge of the economics of agriculture is generally recognized. Constructive accomplishment in this field requires thorough training in economics combined with a comprehensive grasp of its application to the special conditions of agriculture.

Shortage of well-trained marketing personnel, at both Federal and State levels, critically handicaps developing a well-rounded program under the Agricultural Research and Marketing Act. The greatest immediate need is for men with advanced training who can undertake independent work in new fields. The broad expansion of activities scheduled under the Act also will continue and intensify the need for adequately prepared college graduates. On both problems the Department of Agriculture is cooperating closely with land-grant institutions. Joint committees have analyzed and mapped out attack on these problems. As part of this plan the Graduate School has given special advanced training to Washington personnel engaged in marketing work, and regularly offers both introductory and advanced courses in this field.

Upon request, arrangements may be made to take any of the following courses as reading courses whenever there is insufficient enrollment for a regular class. Students who are interested in such an arrangement may consult the Registrar.

[7-203.] Introduction to Marketing (1957–58 and alternate years)

Fall, 3 credits — Bennett S. White

A preliminary course intended to provide orientation for the study of marketing as (1) a type of production which supplies essential services, and (2) a valuation process in which the prices of agricultural commodities are established. Marketing machinery costs, functions, methods and practices are surveyed. Marketing specialists of the Department of Agriculture will lead discussions relating to particular commodities and special problems. *Prerequisite:* A basic course in economics.

7-409. Farm Management

Spring, 2 credits (alternate years) — Wylie D. Goodsell

An advanced course in farm organization and management which combines development of economic principles of farm production with practical application to the planning and operation of farms of different types, sizes, and locations. The practical and theoretical aspects of purchasing, organizing, operating, and managing farms are treated. Consideration is given also to economic adjustments needed in specific farming areas and for the nation.

7-414. Economics of Marketing

Year, 2 credits each semester (alternate years)
H. M. Southworth and Harry C. Trelogan

An advanced course in which economic aspects of marketing agricultural commodities are systematically analyzed, with main emphasis on applying modern economic concepts to the successive problem areas developed. The first semester considers marketing, including transportation, storage, processing, and distribution, as a process of production. It explores the use of resources in this production, the effects of market institutions and organizations upon the use of resources and the productive services performed, and the criteria of efficiency of this productive process and of public policy designed to improve it. The second semester considers the market as a mechanism for establishing prices. It explores the functions of market prices, the process of price-making, the effects of market organization and practices, and the relationships between margins and the costs of productive services in marketing, and the criteria of efficiency in price-making and of public measures that regulate or intervene in the price-making process. *Prerequisite:* Principles of Economics and Introduction to Marketing, or equivalent as approved by instructors.

[7-472.] Production Economics of Agriculture (1957–58 and alternate years)

Fall, 3 credits — Kenneth L. Bachman and Russell W. Bierman

The development and application of basic economic principles and analytical methods important in agricultural production. Application of economic principles to the determination of the most profitable combination of production resources and enterprises from the standpoint of both the individual farm and United States agriculture. Particular problems studied are agricultural risk and uncertainty, changes in agricultural production and practices, agricultural finance, credit and insurance, land values and tenure, and low income farms.

7-475. World Agriculture and Foreign Markets

Year, 2 credits each semester — CLAYTON E. WHIPPLE and ASSOCIATES

The influence of climate, soil, topography, and density and distribution of population on world agriculture. The problems encountered in collecting and analyzing statistics on world production, trade, and consumption of principal crop and livestock products. How countries of strategic importance have adapted their agriculture to climatic and economic conditions.

7-575. Agricultural Prices

Fall, 2 credits — Instructor to be announced

This is a broad course which presents some of the main results of research in agricultural prices and provides an introduction to research methods in this field. Discussion of trends, seasonal variations, and cycles in agricultural prices. A survey of available information about the effects of price changes on the consumption and production of farm products. How agricultural prices are affected by changes in such economic factors as business conditions and consumer incomes, as well as by changes in Government programs and policies. An analysis of geographic price differences in relation to such factors as transportation rates, methods of marketing, and differences in variety, grade, and quality. *Prerequisite:* Elementary courses in statistics and in economic theory.

7-716. Agricultural Policies and Programs—Seminar

Fall, 2 credits — O. C. STINE

Analysis and evaluation of current agricultural policies and programs in terms of economic principles, the nature of production and marketing problems in agriculture, and the relation of agricultural policies to the dynamic forces in our national economy at the present time. Major attention is given to farm price support and stabilization programs. *Prerequisite:* A college degree in agriculture or a related field with some courses in economics, or operational responsibility in an agricultural program.

[7-719.] Resource Economics—Seminar (1957–58 and alternate years)

Spring, 3 credits — MARK M. REGAN

Practices and problems in the economic analysis of land and water resource programs. Study of prevailing and proposed practices for project formulation, economic justification and cost sharing. Analysts and administrators of various resource agencies participate in discussions of their special fields. *Prerequisite:* Graduate work in agricultural economics, or consent of instructor.

7-720. Production Policies and Programs

Spring, 2 credits (alternate years) — SHERMAN E. JOHNSON

A seminar dealing with special problems in the broad field of economics of production. Students prepare papers on problems of interest in their special fields. Different research workers and administrators participate in the discussion of current problems under the guidance and coordination of the instructor. *Prerequisite:* Graduate work in agricultural economics.

[7-722.] Marketing—Seminar (1957–58 and alternate years)

Spring, 2 credits — HARRY C. TRELOGAN

A seminar for advanced students interested in current research and service developments. Selected projects are reviewed to indicate newer research techniques and service methods used in agricultural marketing. Projects are exam-

ined in terms of background need for the work, objectives of the activities, and relationships to other phases of a general program of marketing research. Economic, statistical and management problems involving market costs, quality, organization and information are featured in the material selected for analytical review. A term paper on a related topic will be required for credit. *Prerequisite:* Courses in elementary economics and statistics plus advanced courses or responsible experience in marketing.

Transportation

7-245. Transportation Rates and Rate Determination

Fall, 2 credits — Sidney C. Dowell

The use of traffic documents, commodity classifications, tariffs, and traffic publications for the several forms of transportation. Study of rate principles and the history of major rate adjustments. *Prerequisite:* Experience in some aspect of transportation work.

Cooperative Extension Education

committee

Mary L. Collings (Chairman)

J. E. Crosby, Jr.
Joseph P. Flannery
Max K. Hinds
Chester C. Lang
Alice Linn
Joseph L. Matthews
Lester A. Schlup
Kenneth F. Warner

Cooperative extension education consists of the off-campus, nonresident teaching service of the land-grant institutions in cooperation with the USDA and the leadership of a county. It is the largest non-school educational program in the United States. The growing interest, on the part of county agents, supervisors, specialists, and training personnel, in advanced study under the guidance of the Federal extension staff has led the Graduate School to appoint a committee on Cooperative Extension Education. This committee has the responsibility for giving guidance to students toward a program best suited to the individual's needs, within the framework of the Graduate School. This program may well lead to an advanced degree depending upon the plans of the student and the cooperative arrangements with local educational institutions and the Graduate School.

The following courses are given as the demand justifies:

7-450. Principles and Techniques of Extension Teaching

Spring, 2 credits — Kenneth F. Warner

This course is designed primarily for extension workers. The principles and techniques of educational methods are applied to extension work. The relative influence of teaching methods are studied from the point of view of reaching and teaching more people.

7-535. Methods of Evaluating Educational Programs

Fall, 2 credits — Laurel K. Sabrosky and Others

Clarification of objectives, data collection, sampling procedures, analysis, interpretation, presentation, and use of data. This course is especially adapted to extension programs, but principles and procedures are applicable to all voluntary educational programs. It is not the intention to make a "studies expert" of each student, but to give a broad concept of methods of systematically appraising work and programs.

7-596. Development of County Programs

Spring, 2 credits — Joseph L. Matthews

A systematic study of methods of developing voluntary county educational programs, including sources of essential basic information; the role of lay people and of supervisors, specialists, and county workers; use of planning committees; step-by-step procedures; coordinated county plans; and characteristics of good programs. Special reference will be made to Extension programs, but principles and procedures are applicable to all voluntary educational programs.

7-732. Four-H Club Programs—Seminar

Fall or Spring, 3 to 5 credits — E. W. Aiton

Major emphasis in this seminar is on objectives and principles for planning effective educational programs for rural young people at the county level. Class periods are devoted to presentations, discussion, and some lecture. Individual problems of class members are considered.

Human Relations

COMMITTEE

Margaret Jarman Hagood (Chairman)

Katharine P. Beardsley — Forrest E. Clements
John M. Brewster — Conrad F. Taeuber
Carl C. Taylor

Courses in human relations are planned to meet the needs of four types of students: (1) those who wish a general rather than specialized knowledge of social problems and processes; (2) those who wish substantial first undergraduate courses in sociology and psychology; (3) those who wish specialized undergraduate and graduate courses in these same fields; and (4) mature persons who wish courses which use the knowledge of all social sciences in considering public issues and policy.

7-105. Introduction to the Study of Human Relations

Fall, 2 credits. Repeated in Spring — Joseph A. Connell

A study of the contributions of the various social sciences, but especially sociology, psychology and anthropology, to an understanding of human behavior. An integrative course for students who have not had an opportunity to study any of the sociological sciences. Designed to acquaint students with techniques and principles used in describing and analyzing human relations. Should not be taken by students academically prepared to do advanced work in this field.

7-210. General Psychology

Fall, 3 credits — Richard S. Fitzpatrick

Psychological theory and principles, based on experimental fact and observation, and interpretation of human relations which begin with the development and capabilities of the human personality. Adjustment of the personality to environment. Lack of proper adjustment and the resulting varying degrees of mental illness calling for psychotherapy. How man sees his world; what influences his relations with his environment and examination of these relations in selected human situations: marriage, job, and such problem areas as delinquency, crime, and addiction. Students take a selected group of psychological tests during the course.

7-215. General Sociology

Spring, 3 credits — Carl C. Taylor

The purpose of the course is to orient the student to the fundamental concepts and principles in human social behavior: the role of science in understanding human behavior, geographic and biological factors in human behavior, uniformities and variations in culture, social organization and disorganization, sociopsychological dynamics in normal and abnormal personality development, race relations, social class and caste, American social institutions, social and cultural change. Lectures, class discussions, student reports, films, and field trips.

[7-303.] Child and Adolescent Psychology (1957–58 and alternate years)

Spring, 2 credits — Katharine P. Beardsley

Study of the development of human behavior from the prenatal period through adolescence in terms of the processes of physical, mental, emotional and social growth in the individual. Particular emphasis is given to the interactions of the child's total personality.

7-304. The Conditions of Personality Growth

Fall, 2 credits — Katharine P. Beardsley

This course treats the principal factors influencing personality development: physiological bases, early experiences and cultural determinants. It considers both experimental and clinical contributions to the study of personality, and their application to practical problems of understanding and dealing with people.

7-400. Introduction to General Semantics

Fall, 2 credits — J. A. Saunders

General Semantics may be defined as a study of human responses to language and other symbols; the relationships between words and things and between language and human behavior. It may be considered as a synthesis of science and the formulation of the general methods of science in such a way that they may be applied by the average individual to help him solve his every problem. The great majority of people who learn to apply the principles and methods of semantics find that these facilitate communication between individuals and between groups; eliminate the common errors in thinking which practically everyone makes at times and enables them to find more appropriate solutions to many of their problems (personal, professional, economic and social) in a shorter period of time and with a less expenditure of energy.

7-433. Social Psychology

Spring, 3 credits — Richard S. Fitzpatrick

A general course on the social aspects of personality, social interaction and collective behavior. It includes treatments of cultural conditioning of personality, personality measurement, communication, public opinion, propaganda, censorship, mobs, riots, and social movements. *Prerequisite:* A course in general psychology.

7-442. Personality Disorders

Spring, 2 credits (alternate years) — Albert C. Cornsweet

This course through lectures and case discussion deals with personality variations as seen among normal people, stressing the significance of such variation in social and occupational adjustment, and with major types of abnormal personalities with emphasis on recognition of these deviations. Designed to help meet the needs of placement officers, counselors and others who through interviews or other media must recognize and deal with problems of emotional maladjustment. *Prerequisite:* A course in general psychology or equivalent.

[7-482.] Social Psychology of Communication (1957–58 and alternate years)

Fall, 3 credits — Richard S. Fitzpatrick

Interpretation of communication research studies in light of social psychological theory. Analysis of social psychological theory for insight into communication habits and impact. Study of the social psychology of perception, value, leisure time, and cultural differences as they affect communications by mass media. Learning theory and educational level as they affect communication behavior. Communication behavior in selected cultures. Social psychological bases for opinion formation and implications of opinion shifts and changes. Analysis of communication systems and data for research purposes. Constructing a theory of the social psychology of mass media. *Prerequisite:* Permission of instructor.

[7-533.] Research Methods in Human Relations (1957–58 and alternate years)

Spring, 3 credits — Richard S. Fitzpatrick

Acquaints the student with the techniques available to solve problems involving human relations in an organizational setting by standard research methods. Students are required to identify problems, show how they have been studied in the past and suggest new or modified approaches for investigating them. Includes systematic examination and appraisal of surveys (extensive, intensive, and informal interviews), scales, projective techniques, pencil and paper tests, observational techniques, re-analysis of existing data, field and laboratory experiments. *Prerequisite:* Courses in sociology and psychology.

7-541. Improving Human Relations and Group Behavior

Fall, 2 credits. Repeated in Spring — Carl F. Bauer

This course is designed to provide diagnostic practice training and experience in bettering human relations, group behavior, and in solving group problems of conflict, apathy, and inadequate decision-making. Includes training in the leadership team method in terms of occupational and organizational settings where groups are important instruments of deliberation, action, and learning. Skill practice in relationship therapy, non-directive counseling, free association discussion and its value, problem-inventory, feed-back, evaluation, role-playing, and the group decision method. The course is based upon a theoretical study of four major approaches to the investigation of modern group life.

6-453. Human Relations in Administration (See p. 60)

7-730. Seminar—Cultural Change in Contemporary Cultures

Fall, 2 credits M. L. Wilson, Thelma A. Dreis, and Specialists

A survey of past and present international and national programs in the field of technical assistance in cooperation with other countries. Analysis and discussion of case histories. Presentations by individuals who have had significant experience in connection with Point IV programs. Development of criteria for evaluating the effectiveness of these programs and the basic problems, principles and lessons for the future which grow out of them. Administrators, social scientists, educators and various technical people in Washington who have had Point IV experience meet with the seminar. Special emphasis given to the development of programs by foreign countries and problems of coordination in the fields of agriculture, health, education, public administration and resource development. Consideration of various types of methods and techniques at the village level, together with techniques connected with training, administration, and evaluation. While the point of view of the course is the total culture and economy of a country, emphasis is placed on the rural aspects and village development with some consideration of urban programs.

History and International Relations

COMMITTEE

H. Duncan Hall (Chairman)

O. B. Conaway, Jr. Clayton E. Whipple
Wayne D. Rasmussen Francis O. Wilcox

Courses on history and international relations have a central place in any university. This is specially true in relation to the Graduate School which serves the needs of government employees, for officials and students in Washington live and work in an international atmosphere. International facts and problems are part of their daily background. They have to be specially aware of the subtle interplay of national and international aspects of government activities. They meet, and many of them work with, foreign officials. In addition to the need—shared with every alert citizen—to understand the main underlying factors in world politics and economies, they have a special occupational interest. They need to learn something about the ideas, assumptions and national backgrounds of foreign officials, about how foreign governments work, how things are done in foreign countries. They need to be aware of the factors that affect the policies of other countries as well as their own.

The Graduate School is making an effort to meet these special needs. Its program, which is designed to make more effective use of the unique local teaching resources in Washington as a world capital, should be especially useful to individuals likely to have personal contacts with foreign officials and businessmen and those who have to deal with problems which have international aspects, including American interests in foreign countries. The program also

will be of value to those who wish to increase their understanding of foreign affairs in a general way, or in a particular field.

7-250. American History to 1865

Fall, 3 credits — Wayne D. Rasmussen

A survey of the political, social, economic, and cultural forces, prior to 1865, which have contributed to the development of American civilization. Includes a summary of the colonial period; the political, economic, and diplomatic factors of the American Revolution; and the development of national life and institutions.

7-251. American History since 1865

Spring, 3 credits — Wayne D. Rasmussen

A survey of the political, social, economic, and cultural forces which, since 1865, have contributed to the development of present-day American civilization. Includes the frontier movement and immigration; constitutional growth and changes in world relations; and economic change and development.

7-324. International Relations

Fall, 3 credits — H. Duncan Hall and H. M. Spitzer

An introductory course dealing with the permanent and basic elements in world politics. Topics include the nature, motive forces, and organization of the State system; international politics as a struggle for power; the nature, role, and limitations of national power; the balance of power; the factors of morality and law; geography, climate, fertility; the role of frontiers, dependent areas and peoples; "international frontier" areas and their phenomena; the human factors; population, culture, war in the minds of men, the role of aggression; ideology; the economic factors—raw materials, industry, technology; war defense and peace; international organization.

7-436. The United States and Asia

Spring, 3 credits — Esson M. Gale

Historical background of current problems and conflicts confronting the United States in relation to China and Southeast Asia. China before the revolution and under Communism. Relation of the Communist regime to Chinese traditions. Emergence of new states in Southeast Asia.

Technology

DEPARTMENTAL COMMITTEE

R. G. Hainsworth (Chairman)

Evan L. Flory
Rowland Lyon
Elbridge C. Purdy
J. P. Schaenzer
E. J. Stocking
G. C. Tewinkel

Robley Winfrey

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Various departments and agencies of the Federal Government are engaged in programs such as flood control, soil conservation, power development, mapping, and rural electrification, which involve in varying degrees engineering techniques and professional engineers. They include many functions which require a working knowledge of techniques not provided in the standard engineering courses.

Basically, education in engineering schools is limited by necessity and tradition to a period of four or five years. This short period of training provides sufficient time to assimilate and master only a minimum of the basic sciences. There is little time available for courses which will give the technical student an understanding of the social and economic problems of the world about him. As a result, he fails often to appreciate the impact upon society of the advances of his profession. Moreover, technological techniques and practices are never static and developments in the sciences and in engineering require enlarging and constant reorienting of the engineer's technical background.

The Graduate School, working with representatives of the various Government departments and agencies and of the local chapters of engineering societies, offers courses designed to add to the technical, professional, and administrative background of engineers in the service of the Federal Government. Many courses offered provide training in the latest techniques that colleges and technical institutes often cannot provide.

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Engineering

COMMITTEE

J. P. Schaenzer (Chairman)

J. A. C. Callan
J. H. Gehring
Ferdinand Kaufholz
E. J. Peterson
W. D. Potter
Henry A. Sawchuk
F. F. Snyder
John A. Weber

8-92. Engineering Review for P. E. Examination

Fall, non-credit. Repeated in Spring — Paul S. Dell'Aria

A general refresher course in basic sciences and engineering principles intended to assist in preparation for the basic portions of the District of Columbia Professional Engineer's License Examination (not specific branches of engineering). Covers elements of strength of materials, structures, fluid mechanics, mechanical engineering, electrical engineering and engineering economics. *Prerequisite:* Preferred, those qualified to take the P. E. examination.

8-95. Electrical Engineering Review for P.E. Examination

Fall, non-credit. Repeated in Spring — J. J. A. Jessel and Almon D. Thomas

A refresher course for persons who are preparing for the D. C. Professional Engineer's License Examination in the field of electrical engineering with emphasis on power. Solutions of practical problems. *Prerequisite:* Preferred, those who are qualified to take the examination.

8-110. Principles of Electricity

Spring, 2 credits — David Askegaard

Principles of electricity, emphasizing alternating currents. Covers basic units such as voltage, current and power and their measurement, resistance, voltage regulation, line loss, power factor, three phase systems, etc. The function of equipment used on rural electric distribution systems such as generators, substations, transformers, lightning arrestors, fuses, oil circuit reclosers, etc., will be emphasized.

8-115. Practical Radio and Television

Year, 3 credits each semester — Robert Hauptman

A lecture-demonstration course covering the practical aspects of radio, television, and allied subjects. The use of mathematics is held to a minimum and the basic studies are undertaken in a simple descriptive manner. The first semester deals with electronics fundamentals, amplifiers, and radio receivers. Specific topics include: principles of electronics and radio; electronic components; DC and AC circuit characteristics and analysis; electron tubes; amplifiers; radio receiver fundamentals and applications. The second semester deals with radio transmitters, FM, TV, and miscellaneous subjects. Specific topics include: radio frequency regeneration; radio transmitter fundamentals and applications; fundamentals and applications of frequency modulation and television; propagation, radiation, and antennas; sources of power; test equipment.

This is not a laboratory class. An electronics demonstrator is used in class. Purchase of a radio kit is optional with the student. *Prerequisite:* A general knowledge of algebra and physics of at least high-school level.

8-405. Principles of Specifications

Fall, 2 credits — Benjamin Rosenzweig

A basic course in the principles underlying the government specifications systems. A brief survey will be made of procurement documents and the purposes they serve. The organization of specifications for form, clarity, and effectiveness will be demonstrated. The evolution and ramifications of specifications will be considered with regard to research and development; legal and contractual relations; proprietary items; and government inspection. The division of specifications into performance and formulation types will be reviewed. The problems of standardization and industry coordination will be discussed. *Prerequisite:* Knowledge of procurement, inspection, research and development processes, or specification writing.

8-420. Fundamentals of Standardization

Spring, 2 credits — Benjamin Rosenzweig

A course in the basic principles underlying the concepts of standardization from the engineering and management points of view. Presents the need for rationalizing the approach to design, production, procurement, and supply. Topics included are: the transition from unorganized systems; the development of a common terminology; the creation of a system of control data; a systematic analysis leading to a simplification of supply systems; the contribution of organized specifications to standardization; forms of engineering standardization; the concept of standardization as a management tool. *Prerequisite:* Work in specifications or standards development, procurement, supply, cataloging, or engineering.

8-465. Applied Electronic Theory

Year, 2 credits each semester — H. Walter Price

General principles of electronics; basic characteristics of resistance, capacitance, and inductance taken singly and in combination; practical basic components; elementary circuit analysis particularly as it pertains to series and parallel resonance; circuits with distributed constants; generation and propagation of radio waves; fundamental principles of electron tubes including diodes, triodes, and pentodes; voltage amplification.

The second semester is a continuation and elaboration of subjects undertaken in the first semester: Class A, B and C power amplification; rectifiers and power supplies; sine-wave oscillators; amplitude modulation and detection; frequency modulation; transmitters; receivers including the superheterodyne; basic pulse circuits; fundamentals of television; theory and use of test equipment.

This is an intermediate level course stressing how electronic circuits work. Elementary complex notation will be introduced and extensively used. *Prerequisite:* Physics, algebra, trigonometry, DC electricity, AC electricity, or consent of the instructor. A knowledge of elementary calculus is helpful but not necessary.

8-525. Transistor Electronics

Fall, 3 credits — Albert M. Rubenstein

An introduction to semiconductor principles, point contact transistors, junction transistor, p-n-p and n-p-n transistor characteristics, transistors as low and high frequencies circuit elements, transistor amplifiers and oscillators, measurement of small signal parameters (alpha, a and b), cascade amplifiers, noise in transistors, compensation for temperature variation, equivalent network circuits, and other related topics. *Prerequisite:* Bachelor's degree in physics or electrical engineering, or equivalent professional experience.

5-535. Elements of Fluid Mechanics (See p. 52)

[8-560.] Fundamentals of Telephony—Outside Plant Design (1957–58 and alternate years)

Fall, 2 credits — Thomas J. McDonough

A course in the principles of outside plant design. Pole line, aerial wire, cable, protection, transposition systems and transmission improvement.

[8-561.] Fundamentals of Telephony—Central Office Equipment Design (1957–58 and alternate years)

Spring, 2 credits — Thomas J. McDonough

A course in the principles of central office equipment design. Design of major circuits, trunk circuit design, signaling and supervision, characteristics of

the dial equipment of six manufacturers, traffic determinations for manual and dial systems, numbering, automatic message accounting equipment and other optional equipment and features, influence of toll dialing on central office design, latest advances in voice frequency repeaters, carrier and radio.

8-602. Public Utility Law

Fall, 2 credits — Louis C. Kaplan

A study of the regulation, by Federal and State agencies, of public utility rates and services. Examples are largely drawn from selected problems involved in the regulation of the electric power and natural gas industries. Special consideration is given to the presentation of a case before a public utility commission.

8-664. Distribution Line Design

Fall, 2 credits (alternate years) — J. J. A. Jessel and Almon D. Thomas

Design of the electrical and mechanical features of distribution lines and distribution systems. The course is arranged to give engineers fundamental design techniques based on operational and economic considerations. Subjects covered include: system and area characteristics; selection and spacing of conductors, poles, hardware and transformers; sectionalizing requirements; lightning protection; provisions for area growth. *Prerequisite:* Degree in engineering or equivalent experience.

8-665. Transmission Line Design

Spring, 2 credits (alternate years) — J. J. A. Jessel and Almon D. Thomas

Determination of the electrical and mechanical characteristics of transmission lines to best fulfil the operational and economic needs of the electric power system. The course is designed to give engineers the basic technical steps to be taken in the design of transmission lines. The following subjects are covered: system requirements; route selection; topographical survey; selection and spacing of conductors, poles or towers, hardware and insulators; switching requirements and substation design; lightning protection; system stability and board studies. *Prerequisite:* Degree in engineering or equivalent experience.

Surveying and Mapping

COMMITTEE

G. C. Tewinkel (Chairman)

Walter Dix
George H. Everett
James P. Fondren
Gerald H. Johnson
S. J. Friedman
W. S. Higginson
J. E. King
Gunnar Leifson
Albert L. Nowicki
Ernest Parkin
Robert H. Randall, Jr.

Maps have played an important part in human progress. Today, as never before, they furnish the basis for both military and non-military activities throughout the world. Greater use of maps has brought increasing demand for persons qualified in each of the technical phases of map production and reproduction.

The purpose of the curriculum in surveying and mapping is to offer basic training for those persons who are engaged in the technical and supervisory aspects of map making. The curriculum is in-

tended to give the student a broad knowledge and basic understanding of each of the separate phases of the science; to enable him to understand better the problems, possibilities, and limitations of each of the phases. He can then better plan his own activities toward the economical production of accurate maps. A large part of the curriculum is devoted to geodesy, a subject considered to be of increasing importance in view of modern rapid means of world-wide travel, the consequent need for world-wide charts, and the development of new methods in surveying.

Certificates of Accomplishment in Surveying and Mapping

Certified Statements of Accomplishment in Surveying and Mapping are granted to students who have completed organized courses of study intended to provide basic training for responsible surveying and mapping work. The background required is not necessarily a college degree, but accomplishment of the work leading to the Undergraduate Certificate provides training approximately equivalent to that gained from a year of technical college work. The student completing the courses leading to the Advanced Certificate has acquired technical knowledge at least at the level of the Master's Degree. While neither certificate requires entrance backgrounds of any specified level of college education, the student is reminded that completion of courses in the broader, non-technical subjects which are integral to the standard college curriculum is an important part of his general preparation for responsible work in his chosen profession.

Undergraduate Certificate

Requirements

1. High school graduation. Students should file with the Graduate School, before completion of their certificate program, a transcript of their high school or college record.

2. Thirty semester hours of credit with grades of "C" or better in courses as outlined below.

   (a) Prerequisites: College algebra and trigonometry

   (b) Required courses: (22 credits)

8-135.	Elementary Surveying (3)	8-222.	Mathematics for Cartographers (2)
8-204.	Topographic Surveying (3)	8-223.	Map Projections and Grid Systems (3)
8-251.	Photogrammetry I (3)	8-240.	Cartographic Techniques and Map Reproduction (2)
8-252.	Photogrammetry II (3)		
8-208.	Aerial Photographic Interpretation (3)		

   (c) Related Electives: At least eight hours of credit in courses selected from the related electives listed below.

Advanced Certificate

Requirements

1. High school graduation. Students should file with the Graduate School, before completion of their certificate program, a transcript of their high school or college record.

2. Thirty semester hours of credit with grades of "B" or better in courses as outlined below.

   (a) Prerequisites: College algebra, trigonometry, analytic geometry, and calculus.

   (b) Required courses: (21 credits)

8-217.	Astronomy for Engineers (3)	8-424.	Large Scale Maps (2)
8-218.	Geodetic Surveying (3)	8-425.	Small Scale Maps (2)
8-219.	Computation and Adjustment of Geodetic Observations (3)	8-440.	Elements of Geodesy (3)
8-480.	Photogrammetry III (3)	2-226.	Introduction to Official Writing or
		2-450.	Technical Writing (2)

   (c) Related electives: At least nine hours of credit in courses selected from the related electives listed below.

Related Electives—for both the Undergraduate and Advanced Certificates (17 hours if both certificates are taken)

8-215.	Route Surveying (3)	8-465.	Applied Electronic Theory (4)
8-408.	Advanced Aerial Photographic Interpretation (3)		or
8-203.	General Geology (3)	8-115.	Fundamentals of Radio and Television (6)
8-205.	Practical Geology (3)	2-226.	Introduction to Official Writing (Undergraduate only) (2)
5-455.	Elementary Photogeology (3)	5-360.	General Oceanography (3)
5-326.	General Meteorology (3)		

Equivalent courses are accepted by transcript from other institutions to meet a part of the certificate requirements. Students who wish to use credit earned elsewhere should present the transcript to the Registrar at the beginning of their program.

Students who began work toward the certificate before September, 1956, may follow the requirements outlined in the 1955–56 catalog.

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Surveying

8-135. Elementary Surveying

Fall, 3 credits (every third year) Ernest J. Parkin

Use of the transit, level, compass and accessory equipment; adjustment of instruments; field methods of transit-and-tape traverse and engineers' leveling (differential and profile); computations connected with above including adjustment of traverses by compass and transit rules, computation of latitudes, departures, and areas. Lectures, classroom work, and field work. *Prerequisite:* Plane trigonometry.

8-204. Ground Methods of Topographic Surveying

Spring, 3 credits (every third year) ERNEST J. PARKIN

Transit and stadia; plane table and stadia; approximate methods, special methods for peculiar conditions; Beaman stadia arc; Baldwin solar chart, etc. Lectures, classroom work and field work. *Prerequisite:* Elementary surveying and plane trigonometry.

[8-215.] Route Surveying (1957–58 and every third year)

Fall, 3 credits ERNEST J. PARKIN

Theory and practice of surveying for railroads, highways, canals; preliminary and location surveys, cross sections, earthwork quantities and transition spirals. Lectures, classroom work and field work. *Prerequisite:* Elementary surveying and plane trigonometry.

[8-217.] Astronomy for Engineers (1957–58 and every third year)

Spring, 3 credits ERNEST J. PARKIN

The fundamentals of the circular systems; basis of the determination of time, longitude, latitude and azimuth; the use of instrumental equipment such as altazimuth instrument, zenith telescope, meridian transit, sextant, astrolabe, zenith camera. Lectures, classroom work and field work. *Prerequisite:* Ground Methods of Topographic Surveying or equivalent or permission of the instructor.

[8-218.] Geodetic Surveying (1958–59 and every third year)

Fall, 3 credits ERNEST J. PARKIN

Theory and practice of first- and second-order triangulation, traverse, leveling; use of base-line equipment, repeating and direction theodolites, geodetic leveling equipment; field computations necessary to insure accuracy of observations. *Prerequisite:* Elementary Surveying or permission of instructor.

[8-219.] Computation and Adjustment of Geodetic Observations (1958–59 and every third year)

Spring, 3 credits ERNEST J. PARKIN

The office procedures in final computation and adjustment of field observations introduced in Course 218; least square approach to the adjustment of networks of traverse and leveling and simple triangulation figures. *Prerequisite:* Course 218 or equivalent or permission of instructor.

8-440. Elements of Geodesy

Fall, 3 credits ROBERT L. MESSINGER

Introduction to the elements of geodesy from the geometric viewpoint (basic fundamentals of triangulation and geodetic astronomy) and from the physical viewpoint (distribution of mass and density anomalies). Determination of the figure of the earth, role of deflections of the vertical, and datum determination. Spheroids and their use. The aim of the course is to develop the student to the point where he will be familiar with the interrelations of the separate fields within geodesy and the manner in which they supplement one another in extending our knowledge of the earth. This course is designed for those desiring a general or fundamental knowledge of the elements of geodesy. *Prerequisite:* College algebra and trigonometry.

Photogrammetry

8-120. Introduction to Photogrammetry

Fall, 2 credits — S. J. Friedman

Lectures and demonstrations in non-technical terms cover: the history and development of photogrammetric engineering; the importance of optics; basic principles of photography; types of aerial photography, aerial cameras, accessory equipment, and photographic aircraft; requirements of coverage, flight lines, tilt, and scale; photo interpretation and stereoscopes; requirements of horizontal and vertical control; radial plot and stereoscopic plotting instruments. Designed for persons who use aerial photographs in military planning and operations, highway development, agricultural land use and conservation, mineral and petroleum exploration, and in other engineering and industrial operations.

8-208. Aerial Photographic Interpretation

Fall, 3 credits — Ethan D. Churchill

Principles, techniques and applications of aerial photographic interpretation; history, concepts, types of aerial photographs, principles, techniques, and applications. Study, and use in various fields, of aerial photographs as a source of detailed natural and cultural information. *Prerequisite:* A general background in one of the following fields: surveying and mapping, cartography, geography, geology, forestry, agriculture, architecture, or allied engineering fields.

[8-408.] Advanced Aerial Photographic Interpretation (1957–58 and alternate years)

Spring, 3 credits — Ethan D. Churchill and Specialists

A seminar on the application of aerial photographic interpretation to specialized technical fields, such as forest, range, and wildlife management; agricultural soil, engineering soil and vegetation surveys; geology and petroleum geology; population census in rural and urban areas, etc. *Prerequisite:* Basic training in aerial photographic interpretation. Training in forestry, range management, wildlife management, agriculture, ecology, geography, geology, or engineering desirable.

8-251. Photogrammetry I

Fall, 3 credits — W. S. Higginson

Basic photogrammetric optics; basic geometric characteristics of aerial photographs; aerial cameras; photography and photographic material. Photographic scales and flight planning; radial line plotting methods; elevation determination; photo interpretation; mosaics. *Prerequisite:* College plane trigonometry.

8-252. Photogrammetry II

Spring, 3 credits — G. C. Tewinkel

Geometry of the tilted photograph; theory and use of oblique (tri-met) and horizontal photographs; rectification; theory and practice of the multiplex including equipment, orientation procedures, control, compilation, contours, bridging; stereoscopic plotting instruments. *Prerequisite:* Photogrammetry I as revised, or former courses, Photogrammetry I and II.

8-480. Photogrammetry III

Fall, 3 credits (alternate years) — G. C. Tewinkel

Advanced theoretical details; compensation devices for lens distortion; sources of errors in photogrammetric processes; technique of analyzing systematic errors of bridging; introduction to analytical methods. *Prerequisite:* Photogrammetry II above, or former Photogrammetry IV.

5-455. Photogeology (See p. 50)

Cartography

8-125. Introduction to Cartography

Spring, 2 credits — William A. Foster

The purpose of this course is to introduce the student to the broad field of cartography. This includes general instruction in the history of maps; the shape of the earth; the fundamental concepts of the most common projections; the basic principles of surveying, topography, hydrography, photogrammetry, oceanography and sketch mapping; the classification, evaluation, compilation, construction and revision of maps and charts; and the methods and techniques of reproduction. See also course 5-114, Maps and Charts, in the Department of Physical Sciences.

8-240. Cartographic Techniques and Map Reproduction

Spring, 2 credits — M. S. A. Delaney and Specialists

Designed for persons engaged in the various phases of surveying and mapping. Covers modern media used in the preparation of the original and the original map copy itself for reproduction; the requirements of a good map/chart original; the advantages and disadvantages of photolithography, letter press, and gravure, including ozalid and photo-gelatin; color separation originals, negatives, and printing plates; combining half tones with the contour system. Provides the student with a broad working knowledge of the many steps involved in duplicating the map/chart original in black and white and multicolor work. Economy and precision in map-making is predicated on a knowledge of the process selected for reproduction.

8-222. Mathematics for Cartographers

Fall, 2 credits — George H. Everett

Introduction to the methods of applying mathematical principles to the problems of cartography and the substitution of geographical nomenclature in derived mathematical formulas. Review of selected theorems and mathematical formulas, and a study of their development and significance to cartographic problems. Emphasis is on method as developed in analytical geometry and trigonometry. The course should be useful to those who wish to review their mathematics as applied to cartographic problems, and to those who plan more advanced studies in the field of mathematical cartography. *Prerequisite:* College trigonometry.

8-223. Map Projections and Grid Systems

Spring, 3 credits — Edward W. Fonfara

Includes: basic principles with practical applications; computations; use of tables; layout; definitions; classifications; and characteristics. Identification of such standard projections as the polyconic, mercator, transverse mercator, Lambert conformal, gnomonic, and stereographic; and coordinate systems including rectangular, broad-area and true military grid.

This subject is presented from the practical viewpoint without the complex variable theory applications. *Prerequisite:* College trigonometry.

8-424. Large Scale Maps

Fall, 2 credits — Jacob Skop

Includes a review of the fundamental principles of cartography and the application of these principles with emphasis on large scale maps. Specific topics include: types and scales of maps; classification of the earth's features and their interpretation in symbolization; names; drainage, relief, woodland and vegetation, and other cultural features; foreshore and offshore hydrography; public land surveys; methods and procedures for making large scale maps; pre-compilation preparation; aerial photography; horizontal and vertical control; classification surveys; the compiler and his work; compilation; editing and field checking; color separation drafting; photolithographic reproduction; and military grids. *Prerequisite:* Map Projections and Grid Systems, or equivalent.

8-425. Small Scale Maps

Spring, 2 credits — Robert B. Mercready

Factors to be considered in selecting the projection for the map, the scale, and the material for the compilation; drawing the map and preparing it for reproduction; compilation, reproduction, and use of the Army Map Service series of maps: the Nautical Chart Series including their compilation, reproduction and application to navigation; the Aeronautical Chart Series including their compilation, reproduction, and application to air navigation. *Prerequisite:* Map Projections and Grid Systems, or equivalent.

Fine and Applied Arts

COMMITTEE

Rowland Lyon (Chairman)

Sadye F. Adelson — Garnet W. Jex
Martha L. Hensley — O. A. De La Rosa
Henry A. Magnuson

Fine Arts

8-60. Pencil Sketching and Water Color Painting

Summer, non-credit — Rowland Lyon

An informal class in theory and practice. Student may use either or both media. Class meets out-of-doors whenever possible.

8-320. Water Color Painting

Fall, 2 credits. Repeated in Spring — Rowland Lyon

Theory and practice; painting from landscape and still life.

8-321. Life Sketching

Fall, 2 credits. Repeated in Spring — Duane A. McKenna

A course in drawing based on the premise that the best artistic expression is the product of accurate observation and an adequate understanding of the life we would draw. A course, not in theory or technique, but a series of personal experiences planned to impart an awareness and appreciation of motion, design, and form. The challenges of the class are basic but students with previous training find it a valuable refresher. Enrollment limited to eighteen to insure individual instruction.

8-323. Portrait Painting in Oil

Fall, 2 credits. Repeated in Spring — Pietro Lazzari

To enjoy this course the student need not have experience as an artist but must have the desire to achieve proficiency in portraiture.

Professional methods of painting oil portraits incorporating the basic techniques of the old masters and the spirit of modern art. Course includes, sketching, line composition and light arrangement; color, theory and technique of painting in oil. All work done from life.

8-330. The Grammar of Art: Drawing and Painting

Fall, 2 credits. Continued in Spring — B. Colin Greenly

A foundation course leading to an understanding and appreciation of the use of line, shape, tone, texture, and color in creative drawing and painting. Through personal supervision at the instructor's studio, the student is guided in the elementary practice of drawing and painting. The course is continued in the spring, for new students and for those who wish to go on from the fall semester.

8-333. Survey of Art

Fall, 2 credits — Catharina M. C. Baart

The course is designed to establish the basic values which underlie artistic achievement and to develop an appreciation of these values before the objects themselves. From age to age these basic values—the aesthetic values—remain the same. The lectures will attempt to relate the major epochs to one another so as to indicate the continuity of art history and at the same time contrast the variant forces and ideas which produced such differing styles and expressions.

8-334. Modern Painters

Spring, 2 credits — Catharina M. C. Baart

This course begins with a study of the art of the outstanding masters of the 17th Century and of the general current of painting in that century, with emphasis on the development of painting through the National Schools and styles up to the present moment. The main concern will be to arrive at an understanding and appreciation of impressionism and post-impressionism.

Applied Arts

8-55. Introduction to Interior Decoration

Fall, non-credit. Repeated in Spring — Dorothy F. Gearhart

A non-credit course designed for persons who wish a non-professional knowledge of the principles of color and design to help them with their home-decorating problems. Topics discussed include discovering and using design, elements and principles of design, color and color systems.

8-144. Graphic Arts in the Federal Government

Fall, 2 credits — Maurice Eysenburg, Garnet W. Jex and William Kennedy

Introduction to the study of the elements which comprise the broad field of the graphic arts. The course consists of lectures by persons well qualified in every branch of originating, designing, and executing visual presentations as practiced by government graphics staffs. Demonstrations and assignments serve as themes for round table analysis. Discussion of media and techniques. The course is intended for persons who wish to enter or advance in the field of graphic arts.

8-284. Landscape Design of Small Property

Fall, 2 credits — Henry Schultheis

An introduction to the fundamentals of landscape design with particular emphasis upon the design of small properties. Includes principles of orientation, arrangement and circulation.

8-285. Landscape Use of Trees, Shrubs, Vines, and Flowers

Spring, 2 credits — Henry Schultheis

A study of the principles and practices relating to site, planting, care and maintenance of ornamental trees and shrubs; care and maintenance of lawns and gardens.

Photography

COMMITTEE

Elbridge C. Purdy (Chairman)

James A. Beales
Edward S. Cobb
Raymond Davis
William J. Forsythe
Fred W. Gerretson
Julius Halsman
R. J. Lefebvre
Keith B. Lewis
Albert R. Materazzi
Charles T. Myers, Jr.
Howland Pike

8-70. Popular Photography

Fall, non-credit. Repeated in Spring — William C. McHenry

This is a lecture, demonstration course of a non-technical nature. It is intended particularly for those camera enthusiasts who desire a clearer understanding of how their cameras, films and prints work. Better pictures should be the result of taking this course. Topics covered: camera types and operation; film types and uses; developing and printing; filters; exposure; planning, composition and lighting; portraiture; motion pictures; color photography. Exhibition and demonstration of equipment, materials and techniques supplement class lectures and discussion.

8-161. Lithography I—Camera

Fall, 4 credits. Repeated in Spring — Alexander Novak

Basic information on the principles of lithography and operational procedures. Functions of equipment and explanation of the purpose or use of materials involved in camera work. Function of process cameras and lenses; purpose and uses of various films and darkroom processes; familiarization with fine-line requirements; function and purpose of color filters; halftone principles—optical screens; halftone principles—contact screens; outline of four-color process; purpose of dot-etching, masking, surprints, lateral reversal, etc. Lecture, demonstration, and practice. *Prerequisite:* One year's experience in a lithographic plant; or Fundamentals of Photography I; or the equivalent, subject to the approval of the instructor.

8-163. Lithography II

Fall, 3 credits. Repeated in Spring — Joseph F. Hamm

Continuation of Lithography I, providing advanced and refined study in the field of lithography. Preparation of art and copy; planning and layout; negative engraving and stripping; blueline method for color separation; imposition and register; vinyl plastics in lithography; color proofs on vinyl; chemistry of plate-

making; comparison of various plate-making processes; plate-making techniques; formulas and procedures; offset papers and their uses; composition and application of offset inks and compounds; introduction to presswork; finishing procedures and equipment; latest techniques and materials in lithography; lithographic plant management. *Prerequisite:* Lithography I, or experience in a lithographic plant.

8-192. Fundamentals of Photography I

Fall, 2 credits. Repeated in Spring — Edward S. Cobb

Forms a foundation for all of the more advanced courses in photography. Topics covered: nature of the photographic process; light as applied to photography; factors in development; developing solutions; exposure; lenses and image formation; photographic light and lighting; fixing and washing processes; and principles and use of filters.

8-193. Practice of Photography I

Fall, 2 credits. Repeated in Spring — Harry L. Burnett, Jr.

This course furnishes laboratory practice and demonstration of the principles taught in Fundamentals of Photography I. It offers the student an opportunity to become familiar with recommended procedures and techniques. Topics covered: contact printing and processing; selection of printing papers; processing of negative roll film, cut film and film pack; diagnosis and remedy of processing defects; types of cameras, their operation and uses, and the application of filters. *Prerequisite:* Fundamentals of Photography I, or taken concurrently with Fundamentals of Photography I.

8-195. Fundamentals of Photography II

Spring, 2 credits — Willard E. Vary

Subjects included: practical sensitometry and gradation control; the theory of projection printing; the nature of photographic light, its characteristics, control and measurement; shutter types and their performance; chemistry of photographic processes and the use of color film. *Prerequisite:* Fundamentals of Photography I.

8-196. Practice of Photography II

Spring, 2 credits — Instructor to be announced

Subjects included: application of sensitometric measurements, projection printing, print correction, composite printing, lighting, rendition of form and texture, light patterns, the effect of light on color, toning and print quality analysis. *Prerequisite:* Fundamentals of Photography I, Practice of Photography I, and Fundamentals of Photography II. May be taken concurrently with Fundamentals II.

8-194. Better Pictures through Composition I

Fall, 2 credits — Martin H. Miller

Designed to give practical help to the beginner as well as to the advanced photographer, to the amateur as well as to the professional. Develops understanding and use of the elements that improve pictures: how to see a picture, subject interest, balance, line, tone, mass, design, print quality, cropping, color. Criticism and suggestions to student on his own prints or slides. Practice in analyzing photographs and slides. Students also have opportunity to see and discuss the work of some of America's outstanding pictorial and photo-journalist photographers. Trip to museum or picture-taking outing included.

8-197. Better Pictures through Composition II

Spring, 2 credits — Martin H. Miller

Continuation of 8-194 for new students and for those who wish to go on from the fall semester. Topics covered include: review of basic principles, night photography, prize-winning photography, salon photography, criticism and suggestions to student on his own prints or slides. Practice in analyzing photographs. Picture-taking outings.

8-270. Color Photography I—Monopack Color Printing

Fall, 3 credits — Instructor to be announced

Theory and practice of making color prints on Ansco Printon. Lecture and supervised laboratory work covers in detail: principles of the Printon monopack color process, equipment, selection of transparency, contrast control masking, color compensation filters, exposure control methods and processing. *Prerequisite:* Fundamentals of Photography II and Practice of Photography II, or consent of instructor.

8-271. Color Photography II—Color Film Exposure and Processing

Spring, 3 credits — Instructor to be announced

Theory and practice of exposure and processing color transparency films. Lecture and supervised laboratory work covers in detail: principles of monopack color films, equipment, color compensation filters, light balancing filters, and exposure of color films under studio and daylight conditions. Instruction covers esthetics of color composition, including arrangement, emphasis, choice of objects, camera and lighting techniques. Processing of color transparency films. *Prerequisite:* Fundamentals of Photography II and Practice of Photography II, or consent of instructor.

8-272. Color Photography III—Separation Negatives for Color Printing

Fall, 3 credits — Instructor to be announced

Theory and practice of masking and making color separation negatives for the Dye Transfer Color Printing system. Lecture and supervised laboratory work covers in detail: principles of color correction masking, principles of making color separation negatives, equipment, selection of transparency, production of highlight and principle masks, exposure and development control methods, production of balanced, corrected color separation negatives from transparencies and by direct separation. *Prerequisite:* Color Photography I and Color Photography II or consent of instructor.

8-273. Color Photography IV—Dye Transfer Color Printing

Spring, 3 credits — Instructor to be announced

Theory and practice of making Dye Transfer matrices and transfer technique. Lecture and supervised laboratory work covers in detail: principles of the matrix printing system, equipment, production of balanced sets of matrices, exposure and development control methods, transferring technique. *Prerequisite:* Color Photography III must be completed before registration for this course.

8-360. Portrait Photography

Year, 2 credits each semester — Elbridge C. Purdy

A studio and darkroom course that provides opportunity for practice. The student learns through individual guidance the subtleties of fine portrait work.

Lighting, posing, composition, processing and re-touching. *Prerequisite:* Practice of Photography II.

8-011. Photographic Roundtable

Year, non-credit EDWARD S. COBB, Advisor

The Roundtable has been formed to provide opportunity for the continued study of photography. The group meets twice each month during the regular school year. One meeting is devoted to constructive analysis of photographic work presented by members; the other meeting is devoted to presentation of information about new developments and techniques in photography and to other topics of current interest. The Roundtable sponsors an Annual Salon.

Registration is open to persons who have completed any of the courses in photography offered by the Graduate School. Registration is required, and there is a small registration fee.

Courses Offered at the National Institutes of Health

ADVISORY COMMITTEES

Scientific Courses

Daniel Steinberg (Chairman)
Robert Berliner
Seymour S. Kety
Christian B. Anfinsen
Alan H. Mehler
Bernard L. Horecker
Howard L. Andrews
John C. Lilly
Hewitt G. Fletcher
Roger M. Cole
Justin M. Andrews
David Shakow
Murray C. Brown

Administrative Courses

Glen Wilbur (Chairman)
Richard Henschel
Zelda Schiffman
Robert Learmouth
Esther Deel
Robert Grant
Murray C. Brown

General Studies Courses

Lealon E. Martin (Chairman)
Erich Mosettig
Scott Adams
Albert Dalton
Ralph D. Lillie
Murray C. Brown

In the fall semester, 1954, the National Institutes of Health invited the Graduate School to offer a program of courses at the Bethesda Center which would be designed to meet the particular needs of the employees of that center. All of the classes meet at the National Institutes of Health in Bethesda, and are open to all Government employees and to the general public. Registration may be completed at the National Institutes of Health or at the Graduate School.

Biology and Medicine

1-250. Introductory and General Bacteriology

Year, 2 credits each semester — Norman McCullough

Introductory and general bacteriology developed historically. Includes specific handling of major groups of bacteria and techniques employed in bacteriology. No prerequisite.

1-275. Fundamentals of Virology

Year, 2 credits each semester — W. P. Rowe and W. D. McBride

A course in general virology for professional personnel. The first semester deals with fundamental aspects of animal, bacterial, and plant viruses; the second semester primarily with specific viruses, chiefly those infecting humans.

1-345. Elementary and Biochemical Genetics

Fall, 1 credit — Bruce Ames and Barbara Wright

The first half of the course deals with genetic phenomena in various microorganisms, and includes such topics as the genetics of *Neurospora* and transform-

ing factors in bacteria. The latter half of the course covers the theory and practice of use of microbial mutants in investigating biochemical systems, as well as the biochemistry of some genetically controlled diseases in higher animals. *Prerequisite:* General biology and biochemistry.

1-349. General Mycology

Fall, 2 credits — Leo Pine

An introduction to the fungi, their classification, and relationship to man. *Prerequisite:* Course in general biology, or consent of instructor.

1-449. Medical Mycology

Spring, 2 credits — Leo Pine

A course in fungal diseases of man and animals. Isolation, identification, physiology of the causal organisms, characteristics and treatment of the disease. *Prerequisite:* Course in general mycology, or consent of instructor.

1-422. Human Physiology

Fall, 3 credits — A. V. Wolf

A course in the physiology of health and disease, consisting of lectures, lecture-conferences, and demonstrations. Emphasis is on function in muscle, peripheral nerve, special senses, central and autonomic nervous systems, heart and circulation, respiration, kidney, water and electrolyte balance, temperature regulation, thirst, digestive system, and basal metabolism. *Prerequisite:* One year of undergraduate biology, chemistry, and physics.

1-427. Physiology of Bacteria

Year, 3 credits each semester — Arthur K. Saz

The basic pathways of carbohydrate, protein, fat and amino-acid metabolism. Nutrition of microorganisms. Relationship to higher forms.

Topics covered also include biochemistry of nitrogen fixation, utilization of mutants for elaboration of metabolic pathways, and current status of modes of actions of antibiotics. *Prerequisite:* Organic chemistry or biochemistry or permission of instructor.

1-442. Selected Topics in Invertebrate Physiology

Fall, 1 credit — Theodor von Brand

Lectures on such topics as chemical composition, metabolism parasitic respiration of selected types of invertebrates, such as free living and parasitic protozoa and helminths, mollusks and others. *Prerequisites:* Invertebrate Zoology and at least one course in physiology or biochemistry.

1-455. Cellular Physiology

Year, 2 credits each semester — A. M. Shanes

General chemistry and morphology of the cell. Bioelectrical phenomena and their origin. Permeability, diffusion, and active transport. Excitability phenomena and drug action. Contractility. *Prerequisite:* General college physics, chemistry and biology.

1-505. General Pathology

Fall, 2 credits — George L. Fite

General pathology for non-medical personnel. Basic types of cellular and tissue response to injury. Local and remote effects of inflammation, neoplasia, deficiency and obstructions. *Prerequisite:* Histology or the equivalent.

1-508. Pathology of Infectious Diseases

Spring, 2 credits — George L. Fite

The basic mechanisms of the infectious diseases, especially from the standpoint of cellular responses, emphasizing the variations resulting from hypersensitizations, immune responses, and chronicity. Emphasis on bacterial, fungus, and virus infections, with limited consideration of parasitic infections. Lantern slides and projected microscope slides are used, but there is no direct microscope work.

1-575. Biochemistry of Non-steroid Hormones

Fall, 2 credits — Peter G. Condliffe

A survey of non-steroid hormones. The course covers methods of bioassay, isolation, chemical characterization and interactions with biochemical systems. Particular attention is paid to the hormones of the pituitary, the thyroid and the pancreas. *Prerequisite:* College biochemistry or mammalian physiology or the consent of the instructor.

1-628. Advanced Bacteriology—Bacterial Metabolism

Year, 2 credits each semester — H. C. Ellinghausen

Designed to give a general background in bacterial metabolism as an introduction to more detailed biochemical study. Includes general bacterial physiology and comparative biochemistry; the physiological significance of cellular structures; quantitative growth measurements and their physiological significance with a discussion of the various methods used; the influence of physical conditions on growth and metabolism; bacterial nutrition and chemical needs as illustrated by chemoautotrophs, phototrophs, and heterotrophs; the roles of carbon, nitrogen, minerals, and vitamins, and the influences of antimetabolites; homofermentative and heterofermentative reactions; and recent developments in bacterial physiology, including consideration of terminal respiratory systems, biochemical mutants, simultaneous adaptation, and considerations of pathogenicity and chemotherapy. *Prerequisite:* Introductory bacteriology and college chemistry. Biochemistry desirable.

1-632. Nucleotides and Biological Syntheses

Spring, 2 credits — Herman M. Kalckar

An advanced course dealing with the special problems involved in the biosynthetic pathways in nucleotide formation and of the function of nucleotides in forming reactive building blocks for the synthesis of proteins, nucleic acid, carbohydrates and lipids. *Prerequisite:* Organic chemistry and general biochemistry; a working knowledge of enzyme chemistry.

1-645. Sensory Physiology

Fall, 2 credits — Instructor to be announced

The physiological bases of sensory processes, with emphasis on the neurophysiological aspects of audition and vision. An attempt to correlate relevant facts on end organ structure, neuroanatomical pathways, and experiments in physiological psychology and neurophysiology. *Prerequisite:* Bachelor's degree with working knowledge of physiology, or consent of the instructor.

1-710. Clinical Neuroanatomy

Fall, 2 credits — Instructor to be announced

The embryologic and phylogenetic development of the nervous system, with its segmental and suprasegmental portions and their interconnections. Emphasis

on the anatomic foundations of clinical neurology and experimental neurophysiology. *Prerequisite:* Bachelor's degree (pre-medical equivalent) and consent of the instructor.

1-725. Microbial Biochemistry

Fall, 2 credits — Earl R. Stadtman

A comprehensive treatment of intermediary metabolism as studied in microbial systems. The course begins with some fundamental biochemical concepts and proceeds to detailed consideration of metabolic pathways and mechanisms. *Prerequisite:* Organic chemistry, and preferably general biochemistry.

Chemistry

5-100. General Chemistry

Year, 3 credits each semester (alternate years) — James W. Pratt

This course is intended to provide background in the problems and practices of chemistry for those whose principal interest lies in some other field or who are engaged in chemical work of a sub-professional nature. It includes descriptive chemistry of the commoner elements as well as a consideration, at the appropriate level, of the atomic theory, the periodic table of the elements, valence, the acid-base concepts, oxidation-reduction reactions, reaction rates and equilibria, pH, normality and molarity, and stoichiometry. The use of standard laboratory equipment is demonstrated. Types of mathematical problems related to chemistry are discussed and the student is required to establish a certain proficiency in this area. *Prerequisite:* High school or its equivalent, including one year of high-school algebra.

[5-248.] Organic Chemistry (1957–58 and alternate years)

Year, 3 credits each semester — James W. Pratt

A systematic study of the fundamental chemistry of the compounds of carbon. Individual compounds of special interest, classes of compounds, and general theoretical considerations. The first semester is concerned with aliphatic compounds, the commoner functional groups, and various types of isomerism. The second semester consists principally of aromatic chemistry. *Prerequisite:* General inorganic chemistry or consent of the instructor.

5-316. Introductory Biochemistry

Year, 2 credits each semester — Benjamin Prescott

A comprehensive survey of the chemistry of body constituents and metabolic conversion. The chemistry of carbohydrates, fats and proteins, the composition of tissues and fluids, the action of enzymes and the physiological role of vitamins and hormones are discussed. *Prerequisite:* General inorganic and organic chemistry.

5-349. Physical Chemistry

Year, 2 credits each semester (alternate years) — Instructor to be announced

Lecture course on the states of matter—gases, liquids, and solids; elementary thermodynamics, solutions, homogeneous and heterogeneous equilibria including the phase rule; ionic equilibria, conductance, electromotive force; chemical kinetics and colloids. *Prerequisite:* General chemistry, qualitative and quantitative analysis, physics, and calculus, or permission of the instructor.

5-413. Biophysical Instrumentation

Fall, 2 credits — Robert L. Bowman

A survey course designed to present techniques of physical measurement and control. A descriptive rather than analytical approach covers the methods of measurement and control in use in industrial and physical laboratories. Expedient trail methods and improvisations applicable to research problems are emphasized. *Prerequisite:* College physics, or consent of instructor.

5-417. Chromatography

Fall, 2 credits — Erich Heftmann

Discussion of principles and application of adsorption, partition, ion-exchange, and electro-chromatography. *Prerequisite:* College chemistry.

5-434. Radioisotopes and Their Applications in the Medical Sciences

Spring, 2 credits — Instructor to be announced

A brief introduction to atomic physics and a review of the properties of radioactive isotopes and their emissions. Theoretical and practical aspects of radioassay using proportional, geiger, and scintillation counting. A review of the kinds of information obtainable with isotopic techniques and, with the aid of examples from the literature, an analysis of problems in interpretation of isotope experiments.

5-506. Mechanism of Organic Reactions

Year, 2 credits each semester — Instructor to be announced

A survey of mechanisms according to general principles and reaction types. A theoretical, non-mathematical approach. In the second semester, emphasis is placed on the role of stereochemistry and cyclic intermediates in a variety of organic reactions, particularly those with biochemical implications. *Prerequisite:* Organic chemistry, and a working knowledge of fundamental organic reactions.

5-402. Advanced Organic Chemistry

Fall, 2 credits — Arthur A. Patchett

Current literature is used to furnish examples for discussion of problems in organic chemistry which are of theoretical interest. The treatment is non-mathematical without detailed kinetic analysis. Some knowledge of the writing of reaction mechanisms is assumed.

5-554. Reactivity and Constitution in Organic Chemistry

Year, 2 credits each semester — Instructor to be announced

An introduction into electronic aspects of organic chemistry. The reactivity and characteristics of organic compounds are discussed in the light of modern theories of organic chemistry starting at the level of simple functional groups and fundamental compounds. The latter part of the course deals with poly-functional molecules, natural products, and compounds of biological interest, and deduces their characteristic reactions from the structural formulas. *Prerequisite:* Organic chemistry.

5-648. Protein Chemistry

Fall, 3 credits — Harry A. Saroff

Preparation and properties of proteins; protein solubility; characterization and analysis; titration data and interpretation; the binding of neutral and charged molecules. Size, shape, and structure determinations; degradation and

modification reactions. *Prerequisite:* B.S. in Chemistry. A working knowledge of physical chemistry, preferably one graduate course.

5-719. Enzyme Chemistry

Year, 2 credits each semester — Alan H. Mehler

Present concepts of the nature of enzymes and the mechanisms of biological catalysis, presented as appropriate examples are met in a systematic survey of enzymes. Current developments, with emphasis on experimental methods. *Prerequisite:* General biochemistry, or organic and physical chemistry.

5-49. Elementary Glassblowing

Spring, non-credit — Theodore D. Perrine

The design of blown scientific glassware and the technique of the simpler glassblowing operations will be discussed from the practical point of view of the immediate laboratory needs of the scientific worker. The major part of the course will be devoted to actual glassblowing by the registrants. While the course is intended primarily for beginners, facilities will be available for more advanced glassblowers to perfect their technique.

Mathematics and Statistics

3-165. Survey of Biomathematics

Year, 2 credits each semester — Samuel W. Greenhouse

A broad survey limited to the mathematics particularly applicable to biological problems with emphasis on the useful rather than theory. Text: Feldman's *Biomathematics.* The course begins with logarithms and trigonometry and proceeds over the year to the elements of differentiation and integration and the elements of differential equations. *Prerequisite:* Elements of algebra and plane geometry.

3-406. Introduction to Experimental Statistics

Year, 2 credits each semester — Instructor to be announced

Some of the fundamental bases of statistical analysis, followed by consideration of the tests of significance most generally useful in the analysis of biological experiments. Includes the usual tests of significance, confidence limits, analysis of variance, curve fitting, and bioassay. *Prerequisite:* Bachelor's Degree.

Foreign Languages

2-49. Basic Scientific and Medical Russian

Fall, non-credit — Alexis Shelokov

Introduction to the written Russian language with emphasis on writings in the biological, medical, and related fields. Fundamentals of grammar and syntax combined with readings in simpler texts, progressing to individual assignments in the current Soviet journals in the students' fields of interest.

2-55. Readings in Scientific and Medical Russian

Spring, non-credit — Alexis Shelokov

Weekly reading assignments from Russian journals of student's choice. During class meetings, the assignments are discussed and elucidated. Special attention is given to vocabulary building and review of grammar essentials. *Prerequisite:* Basic Scientific and Medical Russian, or first-year Russian, or equivalent.

2-257. Conversational and Scientific French

Year, 2 credits each semester — Helene Schrecker

Conversational practice for the development of oral facility and training in pronunciation and diction. Vocabulary building through reading of modern scientific literature. Basic review of grammar. *Prerequisite:* Two years of college French or the equivalent.

2-263. Scientific German

Fall, 2 credits. Repeated in Spring — Erich Mosettig

Designed to give the student a reading knowledge of German scientific literature in the fields of chemistry, physics, biology, and medicine. *Prerequisite:* One to two years of high school or college German, or equivalent knowledge of German grammar.

Psychology

7-541. Improving Human Relations and Group Behavior

Fall, 2 credits. Repeated in Spring — Carl F. Bauer

This course is designed to provide diagnostic practice training and experience in bettering human relations, group behavior, and in solving group problems of conflict, apathy, and inadequate decision-making. Includes training in the leadership team method in terms of occupational and organizational settings where groups are important instruments of deliberation, action, and learning. Skill practice in relationship therapy, non-directive counseling, free association discussion and its value, problem-inventory, feed-back, evaluation, role-playing, and the group decision method. The course is based upon a theoretical study of four major approaches to the investigation of modern group life.

Public Speaking

2-212. Improving Professional Speaking I

Fall, 2 credits. Repeated in Spring — Instructor to be announced

A basic course in public speaking designed to enable the student to improve his speaking in general, with emphasis on the handling of speech situations peculiar to professional occupations. Special attention is given to (1) emotional adjustment, (2) the development of an efficient and pleasing voice, and (3) the development of a sense of immediacy and audience contact. These skills are exercised in the weekly preparation and delivery of short speeches, descriptive, informative, or narrative.

2-213. Improving Professional Speaking II

Spring, 2 credits — Instructor to be announced

A continuation of *Improving Professional Speaking I.* Special attention is given to (1) the development of the entire speaking personality as demonstrated through vocal and physical delivery, (2) the development of the ability to select, organize, and develop ideas for presentation, and (3) the development of the ability to read aloud effectively materials from the printed page. These skills are exercised in the weekly preparation and delivery of short speeches, argumentative or persuasive. *Prerequisite:* Improving Professional Speaking I, or its equivalent, or permission of the instructor.

Administration

The Graduate School will organize NIH sections of any courses in administration listed in the general Graduate School catalog pro-

vided there is sufficient registration. The following courses have been selected by the NIH Advisory Committee for Administration as of greatest interest to NIH people.

6-405. Principles and Techniques of O&M Work

Two semesters, 2 credits

Deals with the principles and techniques employed in surveying and analyzing organization and methods problems and in formulating solutions to such problems. Emphasis on planning and conducting procedures surveys; methods and approaches in analyzing and planning organization structures including analysis of the impact of individual and group behavior on formal organization structures and authority; methods of dividing work (production planning) and controlling work flow (production control); relationship of the scientific method to O&M work; analysis of staff and line concepts and relationships including the problem of overcoming resistance to new methods and procedures. *Prerequisite:* Experience in O&M work.

6-430. Public Personnel Administration

One semester, 2 credits ELINOR G. HAYES

Designed for supervisors and administrators wishing to have general familiarity with personnel work, for those in junior personnel staff positions desiring a broad understanding of personnel administration, and for those desiring to enter the field who need a foundation for the more specialized courses in the personnel field. Personnel problems which arise when people are associated together in a work situation; basic personnel policies and practices necessary and useful in treating personnel problems; differences between responsibilities, with respect to personnel administration, of the supervisor and the personnel officer; the various phases of personnel work; study of merit system and forms of organization; civil service legislation at various governmental levels; relationships between the Civil Service Commission and operating agencies and personnel offices of latter; trends in public personnel administration and its relationship to overall management.

4-116. Federal Budgetary Procedure

One semester, 2 credits

This course is designed to assist employees either in budget work or preparatory to taking budget work, up to and including Grade GS-9. It deals with budgetary procedures, including the preparation of estimates, justifications, tabular statements, graphs, etc., and, in connection with budget execution, outlines methods in making allotments, preparation of apportionment and obligation reports, and other methods used in the formulation and execution of the Federal budget.

Correspondence Program

COMMITTEE

E. J. Peterson (Chairman)

Louise O. Bercaw
Mary L. Collings
C. Edwin Davis
William A. DeVaughan
E. R. Draheim
Cannon C. Hearne
Hans S. Hoiberg
James L. Robinson
James H. Starkey
Galen Yates
George A. Young

The following courses are open to qualified field employees of the Federal Government and to others as facilities permit. Persons who wish further information or who wish to register in one of the courses should write to the Registrar, U. S. Department of Agriculture Graduate School, Washington 25, D. C.

125C. Basic Lettering

1 credit (7 lessons) — Eugene May

Designed to familiarize the student with the fundamentals of lettering with applications to soil survey charts and maps. Topics covered are basic strokes, spacing, use of the contour pen, and lettering of symbols on aerial photographs. *Cost:* $10 plus $5 supplies and postage fee (does not include lettering tools).

201C. Administration and Supervision—Basic Principles and Practices

2 credits (16 lessons) — George A. Young

Designed for persons who direct activities of a group of employees, regardless of number, and for those who desire to become qualified to handle supervisory and administrative responsibilities. Basic management principles. Application of these principles in relation to the most effective managerial practices. Consideration of the most prevalent administrative and supervisory deficiencies, their causes and remedies. Assists the student to prepare to serve effectively as the administrative head of an organizational unit. *Cost:* $20 plus $5 supplies and postage fee. Text is recommended but not required.

236C. Report Writing

2 credits (15 lessons) — James Pickens

A practical course designed to aid members of the field forces in preparing memoranda and reports to administrative heads. The fundamentals of English composition are briefly and simply treated, and special attention is given to clear, concise, orderly, informative presentation and to avoiding the more common faults of expression. *Cost:* $20 plus $5 supplies and postage fee, plus the text.

316C. Soils and Soil Management

2 credits (15 lessons) — J. Gordon Steele

Practical aspects of soil management. Physical, chemical, and biological properties of soils. How soils are formed. Soils of different places. How soils are changed by erosion, depletion, and improvement. Management of soils for good production and for their conservation and improvement. *Prerequisite:* Chemistry equivalent to that covered in high school. Students who lack a back-

ground of at least high-school chemistry should expect to do extra reading. Preparation in physics is helpful but not essential. *Cost:* $20 plus $5 supplies and postage fee, plus text.

321C. Farm Forestry

2 credits (15 lessons) JOHN F. PRESTON

A course in the growing of wood as a farm crop. Principles of forestry as integrated with the farm business, and as contrasted with commercial forestry. The management of woods on the farm; development of a farm woodland enterprise. Designed to assist those who teach agriculture or assist farmers in its practice, professional foresters, and farmers to apply forestry techniques to the special problems of growing wood as a farm crop. Students should have access to a farm woodlot since some of the lessons require actual observation. *Cost:* $20 plus $5 supplies and postage fee, plus text.

325C. Legal Aspects of Investigations—Criminal Evidence and Procedure

2 credits (16 lessons) JAMES D. FORBES

Designed to provide investigative personnel and those desiring to prepare for such work, a background and insight into the legal aspects of their investigations: what types of evidence to seek; circumstances and conditions under which the evidence is to be obtained in order to have adequate probative value; and how to prepare such evidence for presentation in court or other procedure. Since all investigations are potential sources of prosecution, the requirements of criminal evidence and procedure often reach into the early stages of investigation. The instruction is designed to provide understandable information without overemphasis of technical aspects. *Prerequisite:* Experience in some type of investigative work. *Cost:* $20 plus $7 supplies and postage fee.

362C. Federal Meat Inspection and Animal Quarantine Laws

2 credits (16 lessons) LOWELL MILLER

A study of the history, constitutionality, and provisions of the Federal Meat Inspection Act and related legislation, and the Animal Quarantine statutes, with particular reference to the law of search and seizure, affidavits, hearsay and other rules of evidence. The course is intended as an aid to administrative officials. No previous legal training is required. *Cost:* $20 and $5 supplies and postage fee.

513C. Statistical Methods in Biology and Agriculture

2 credits (15 lessons) JACOB LIEBERMAN and ASSOCIATES

This course uses Snedecor's textbook "Statistical Methods," and follows its outline largely but not absolutely. Each of the 15 lessons consists of narrative material, textbook assignments, questions, and problems. The reports are returned with corrections and comments. Subjects discussed include simple variation, regression and correlation, analysis of variance and covariance, chi-square, multiple and curvilinear correlation, applications to sampling and experimental design. Practical application of methods is kept to the front. Facility in the use of arithmetic and simple algebra is necessary. *Cost:* $20 plus $5 supplies and postage fee, plus text.

515C. Statistics of Biological Assay

2 credits (15 lessons) F. M. WADLEY

General principles. Specialized methods which have been developed for planning and analyzing experiments. Graded and all-or-none responses. Esti-

mates of potency. Comparisons of materials. Joint action, variances, and other phases. *Prerequisite:* A course similar to Statistical Methods in Biology and Agriculture. *Cost:* $20 plus $5 supplies and postage fee, plus text.

521C. Sampling and Experimental Design

2 credits (16 lessons) F. M. WADLEY

Students enrolling in this course should have a genuine practical interest in experimentation, and some facility in statistical calculations, including analysis of variance as shown by texts like Snedecor's or Goulden's. The course is intended to give the student an introduction to basic concepts, some practice in applying them, and some acquaintance with the literature opening the way to further study. The philosophy and fundamentals are first treated, with some attention to elementary sampling principles. Next are presented lessons on simpler practical designs, as to use and analysis of results. Last come lessons on factorial design, confounding and more complex experiments, including incomplete block designs. "Experimental Designs," by Cochran and Cox, is used as a text, with some supplementary discussion. *Cost:* $20 plus $5 supplies and postage fee, plus text.

533C. Hydrology I

3 credits (16 lessons) MAX A. KOHLER and ASSOCIATES

Review of elementary hydraulic principles basic to a study of flow in natural channels. The phenomena of meteorology which control climate. Methods of collecting data essential to hydrology. The physical characteristics of the land which control the disposition and movement of the earth's water. *Prerequisite:* Physics and algebra. Elementary meteorology, statistics, and engineering are desirable, but not required. *Cost:* $25 plus $5 supplies and postage fee, plus text.

534C. Hydrology II

3 credits (16 lessons) MAX A. KOHLER and ASSOCIATES

The tools used by the hydrologist and the application of these tools to specific problems. Hydrograph analysis, runoff relations, runoff distribution, waves, streamflow routing. Special techniques required in the design of projects. Design and operation of water control works. Small basin problems. River forecasting. *Prerequisite:* Hydrology I or an equivalent course. *Cost:* $25 plus $5 supplies and postage fee. Text used in Hydrology I is used also in this course.

580C. Social and Economic History of Agriculture

2 credits (15 lessons) WAYNE D. RASMUSSEN

Introduction; the geographical basis; indigenous and foreign contributions; agrarian colonization and settlement; land policies; agricultural development by periods, regions, and commodities; farm implements and machinery; labor; tenancy; financing farming operations; transportation and marketing of agricultural products; migration of industries from farm to factory; farmers political movements; agencies promoting agriculture, including individual leadership, societies, fairs, periodicals, State and Federal departments, education, and sciences; agriculture in the life of the Nation. *Cost:* $20 plus $9 supplies and postage fee.

Faculty

Faculty, Departmental and Special Committees

The year following the name represents the first year of association with the Graduate School.

Acker, Laurence W., (1948). Deputy Chief, Army Audit Agency, Department of the Army. Taught at Columbus School of Accounting and Tyler Commercial College. (Public Administration)

Ackerman, Clara B., (1950). M.A., George Washington. Formerly Editor, Extension Service Review, Federal Extension Service, USDA. (Committee on Information)

Adams, Scott, (1954). A.B., Yale; B.L.S., Columbia. Librarian, National Institutes of Health, Department of Health, Education, and Welfare. (NIH)

Adelson, Sadye F., (1949). M.A., California. Nutrition Analyst, Agricultural Research Service, USDA. (Technology)

Aiton, Edward W., (1953). Ed.D., Maryland. Director, Four-H Club and YMW Programs, Federal Extension Service, USDA. (Social Sciences)

Allin, Bushrod W., (1939). Ph.D., Wisconsin. Chairman, Outlook and Situation Board, Agricultural Marketing Service, USDA. Taught at Wisconsin. (Social Sciences)

Ames, Bruce, (1955). Ph.D., California Institute of Technology. Assistant Scientist, National Institute of Arthritis and Metabolic Diseases, National Institutes of Health, Department of Health, Education, and Welfare. (NIH)

Andrews, Howard L., (1954). Chief, General Radiobiology Section, National Cancer Institute, National Institutes of Health, Department of Health, Education, and Welfare. Taught at Brown. (NIH)

Andrews, Justin M., (1954). D.Sc., Johns Hopkins. Associate Chief, Bureau of State Services, Public Health Service, Department of Health, Education, and Welfare. Taught at Johns Hopkins, Emory University Medical School, and University of the Philippines. (NIH)

Anfinsen, Christian B., (1954). Ph.D., Harvard. Chief, Laboratory of Cellular Physiology and Metabolism, National Institutes of Health, Department of Health, Education, and Welfare. Taught at Harvard. (NIH)

Appleman, Paul L., (1946). Occupational Specialist, Bureau of Programs and Standards, Civil Service Commission. (Public Administration)

Armstrong, Dorothy, (1955). Supervisory Project Planner, Bureau of Census, Department of Commerce. (Mathematics and Statistics)

Armstrong, Lancelot W., (1955). Staff Assistant, Office of Assistant Secretary of Army, Department of Defense. (Mathematics and Statistics)

Arnold, Olga Moore, (1954). B.A., Wyoming. Information Specialist, U. S. Information Agency. (Languages and Literature)

Askegaard, David, (1950). B.S., North Dakota. Head, Operations Section 8, Southwest Area, Rural Electrification Administration, USDA. (Technology)

Aylesworth, Philip F., (1949). M.S., Purdue. Assistant to the Administrator, Federal Extension Service, USDA. (Social Sciences)

Baart, Catharina M. C., (1955). M.A., George Washington. Museum Aid, National Gallery of Art. Taught at George Washington and Arlington Hall Junior College. (Technology)

Bachman, Kenneth L., (1950). Ph.D., Harvard. Head, Production Income and Cost Section, Production Economics Research Branch, Agricultural Research Service, USDA. (Social Sciences)

Bahn, Catherine I., (1953). M.A., Columbia. Chief, Chart Library Section, Aeronautical Chart and Information Center, Department of the Air Force. (Physical Sciences)

Baker, Gladys L., (1945). Ph.D., Chicago. Agricultural Historian, Agricultural Marketing Service, USDA. (Public Administration)

Baldauf, Tony M., (1951). Chief, Procurement and Property Management Division, Office of Plant and Operations, USDA. (Office Techniques; Public Administration)

Bamford, Ronald, (1949). Ph.D., Columbia. Dean of Graduate School, University of Maryland. (Biological Sciences)

Bargin, Germaine, (1954). Diplomee, Universite de Paris and de l'Institut d'Amerique Latine de Mexico. Part-Time Lecturer in French, Catholic University. (Languages and Literature)

Barnes, Carl B., (1955). Chief, Classification and Organization Branch, Commodity Stabilization Service, USDA. (Committee on Internship Cooperation)

Bartlett, L. George, (1947). C.P.A., B.C.S., Southeastern. Reviewing Examiner, Examination Division, Farm Credit Administration. (Committee on Internal Audit)

Bates, C. C., (1955). Ph.D., Texas A & M. Deputy Director, Division of Oceanography, Hydrographic Office, Department of the Navy. (Physical Sciences)

Bauer, Carl F., (1955). A.B., St. John's. Lecturer, National Catholic School of Social Service, Catholic University. (Social Sciences; NIH)

Bauer, Magna E., (1943). Auguste Victoria Lyzeum, Berlin. Office of the Chief of Military History, Department of the Army. (Languages and Literature)

Beales, James A., (1948). Chief, Photographic Section, Facilities Branch, U. S. Information Agency. (Technology)

Bear, N. Robert, (1948). B.S., Ohio State. Chief, Division of Organization and Personnel Management, Office of Personnel, USDA. Taught at Ohio State and Michigan State. (Public Administration)

Beardsley, Katherine P., (1953). Ph.D., Columbia. Clinical Psychology Branch, St. Elizabeth's Hospital. Taught at Briarcliff Junior College, Finch Jr. College, Columbia, Mt. Vernon Junior College, and American. (Social Sciences)

Beauchamp, George E., (1944). Ph.D., Northwestern. Taught at Manchester College, Northwestern, and Nottingham. (Languages and Literature)

Becknell, Harvey E., (1949). M.A., Columbia. Chief, Division of Training and Utilization, Office of Personnel Administration, Department of Labor. (Public Administration)

Bell, E. Donald, (1951). Office of Assistant Vice-President for Labor Relations, Southern Railway System. (Office Techniques)

Benton, Mildred C., (1950). A.B. in L.S., George Washington. Consultant in Research Information, Naval Research Laboratory. (Physical Sciences)

Bercaw, Louise O., (1949). Assistant Director of the Library, USDA. (Committee on Correspondence Study and Extension Education)

Berliner, Robert, (1955). M.D., Columbia. Associate Director in Charge, National Heart Institute, National Institutes of Health, Department of Health, Education, and Welfare. Taught at Columbia, George Washington, and New York. (NIH)

Berlinsky, Stanley L., (1954). Ph.D., Michigan. Private Practice, Speech Correction. Taught at Michigan. (Languages and Literature)

Bierman, Russell W., (1953). Ph.D., Harvard. Agricultural Economist, Agricultural Research Service, USDA. (Social Sciences)

Bitner, Harry, (1956). B.S. in L.S., Illinois; LL.B., University of Kansas City. Librarian, Department of Justice. Taught at University of Kansas City School of Law. (Languages and Literature)

Blickensderfer, J. P., (1949). Ph.D., Harvard. Editor, U. S. Quarterly Book Review, Library of Congress. Taught at Oklahoma, Washington, Harvard, and Pittsburgh. (Languages and Literature)

Bollo, Louise E., (1952). A.B., George Washington. Nosologist, Public Health Service, Department of Health, Education and Welfare. (Biological Sciences)

Bonniwell, Marion E., (1954). A.B., B.A. in L.S., William & Mary. Librarian, Bureau of Ships, Department of the Navy. Taught at Maryland. (Languages and Literature)

Botts, Ralph R., (1946). B.S., Florida. Agricultural Economist, Production Economics Research Branch, Agricultural Research Service, USDA. (Office Techniques; Public Administration; Mathematics and Statistics)

Bowman, Robert L., (1954). M.D., New York. Surgeon, National Heart Institute, National Institutes of Health, Department of Health, Education, and Welfare. (NIH)

Boyd, Lucile N., (1954). Training Officer, Internal Revenue Service, Department of the Treasury. Taught at Chillicothe Business College, Missouri. (Office Techniques)

Brasfield, Karney A., (1952). C.P.A., B.S., Washington University in St. Louis. Assistant to the Comptroller General, General Accounting Office. (Public Administration)

Brewster, John M., (1949). Ph.D., Columbia. Agricultural Economist, Agricultural Marketing Service, USDA. Taught at Columbia. (Social Sciences)

Brown, Murray C., (1954). M.D., Virginia. Chief, Clinical and Professional Education, National Institutes of Health, Department of Health, Education, and Welfare. (NIH)

Brown, Philip, (1956). A.B., Niagara. Director, Information Staff, Farmers Home Administration, USDA. (Committee on Information)

Buckley, James L., (1941). LL.B., Georgetown. Assistant Director of Personnel, USDA (Public Administration)

Burkhart, M. D., (1955). M.S., Pennsylvania State. Oceanographer, Hydrographic Office, Department of the Navy. (Physical Sciences)

Burnett, Harry L., Jr., (1956). In charge of Photographic Services, Office of Architect of the Capitol. (Technology)

Butler, Frances A., (1952). Director of Business and Secretarial School, Emerson Institute Taught at Temple Secretarial School. (Office Techniques)

Butler, K. A., (1949). B.S., Minnesota. Director of Program Appraisal and Internal Audit, Agricultural Research Service, USDA. (Public Administration)

Callan, J. A. C., (1949). M.A., M.C.E., Union. Research Engineer, Engineer Research and Development Laboratory, Department of the Army. Taught at Union and Alabama Polytechnic. (Technology)

Carlin, Albert V., (1951). B.S., Boston. Chief of Training, U. S. Weather Bureau, Department of Commerce. (Physical Sciences)

Carlson, Theodora E., (1952). A.B., Nebraska. Editor, "School Life," Office of Education, Department of Health, Education, and Welfare. (Committee on Publications)

Carter, Paul S., (1955). M.B.A., Northwestern. C.P.A. Supervisory Auditor, Army Audit Agency, Department of the Army. (Public Administration)

Cavin, James P., (1938). Ph.D., Harvard. Chief, Statistical and Historical Research Branch, Agricultural Economics Division, Agricultural Marketing Service, USDA. Taught at Catholic and Puerto Rico. (Social Sciences)

Churchill, Ethan D., (1950). Ph.D., Catholic. Consulting Ecologist. Intelligence and Systems Analyst. (Technology)

Clements, Forrest E., (1949). Ph.D., California. Consultant, Steward, Dougall and Associates, Inc. Taught at California, Yale and Oklahoma. (Social Sciences)

Cobb, Edward S., (1947). Head, Specifications and Tests, Naval Photographic Center, Department of the Navy. (Technology)

Cochran, William G., (1946). M.A., Cambridge. Professor of Biostatistics, Johns Hopkins University. Taught at Iowa State and North Carolina. (Mathematics and Statistics)

COLE, ROGER M., (1954). Ph.D., Harvard; M.D., Boston University. Chief, Rheumatic Fever Unit, National Institute of Allergies and Infectious Diseases, National Institutes of Health, Department of Health, Education, and Welfare. (NIH)

COLLINGS, MARY LOUISE, (1952). M.A., Northwestern. Chief, Personnel Training Branch, Division of Extension Research and Training, Federal Extension Service, USDA. (Social Sciences; Committee on Correspondence Study and Extension Education)

COMPTON, LAWRENCE V., (1952). M.A., California. Head Biologist, Soil Conservation Service, USDA. (Biological Sciences)

CONDLIFFE, PETER G., (1956). Ph.D., California. Chemist, National Institute of Arthritis and Metabolic Diseases, National Institutes of Health, Department of Health, Education, and Welfare. Taught at Cornell. (NIH)

CONNELL, JOSEPH A., (1956). M.A., Pennsylvania. Research, Catholic University. Taught at Catholic University. (Social Sciences)

COOK, RICHARD F., (1955). A.B., National. C.P.A., Assistant Director for Administration, United States Information Agency. Taught at Catholic and Strayer. (Public Administration)

COOPER, JOHN C., (1946). A.B., Furman. Deputy Director, Office of Budget and Finance, USDA. (Public Administration)

CORNSWEET, ALBERT C., (1947). Ph.D., North Carolina. Chief, Clinical Psychologist, Mental Hygiene Clinic, Washington Regional Office, Veterans Administration. Professorial Lecturer at American University. Taught at Brown and North Carolina. (Social Sciences)

COWING, AMY G., (1947). B.A., B.Ed., George Washington. Extension Analyst, Division of Extension Research and Training, Federal Extension Service, USDA. (Languages and Literature)

CROSBY, J. E., JR., (1956). M.A., Missouri. Director, Division of Agricultural Programs, Federal Extension Service, USDA. Taught at Missouri, Colorado A and M, Mississippi A and M. (Social Sciences)

DALTON, ALBERT, (1954). Ph.D., Harvard. Psychologist, National Cancer Institute, National Institutes of Health, Department of Health, Education, and Welfare. Taught at Harvard, City College of the City of New York, Western Reserve, McGill, and Johns Hopkins. (NIH)

DALY, JOSEPH F., (1941). Ph.D., Princeton. Chief Mathematical Statistician, Bureau of the Census, Department of Commerce. Taught at Princeton and Catholic University. (Mathematics and Statistics)

DAVIS, C. EDWIN, (1954). M.A., Texas. Assistant Director, Personnel Division, Farmers Home Administration, USDA. (Committee on Correspondence Study and Extension Education)

DAVIS, FLOYD E., (1950). M.S., Ohio State. Chief, Livestock and Livestock Products and Poultry Branch, Office of Food and Agriculture, International Cooperation Administration. (Social Sciences)

DAVIS, RAYMOND, (1946). Chief, Photographic Technologist Section, National Bureau of Standards, Department of Commerce. (Technology)

DEEL, ESTHER, (1954). B.S., Winthrop. Administrative Assistant to Associate Director for Extramural Programs, National Institutes of Health, Department of Health, Education, and Welfare. (NIH)

DELANEY, MAURICE S. A., (1948) Technical Assistant to the Director, Division of Chart Construction, Hydrographic Office, Department of the Navy. (Technology)

DE LA ROSA, O. A., (1953). M.S., Catholic. Architect, Engineering and Architectural Design Branch, Bureau of Yards and Docks, Department of the Navy. (Technology)

DELL'ARIA, PAUL S., (1954). B.C.E., City College of New York. Engineer, David Taylor Model Basin, Department of the Navy. Past President, D. C. Society of Professional Engineers. (Technology)

DE VAUGHAN, WILLIAM A., (1954). Chief, Employee Development and Safety Branch, Personnel Division, Agricultural Research Service, USDA. (Committee on Correspondence Study and Extension Education)

DEVRIES, P. H., (1949). M.A., Michigan. Chief, Price Support and Commodity Operations, Commodity Stabilization Service, USDA. Taught at Michigan State. (Committee on Publications)

DEXTER, WAYNE V., (1950). B.S., Kansas State. Information Specialist, Office of the Administrator, Agricultural Marketing Service, USDA. (Committee on Information)

DIX, WALTER S., (1952). Civil Engineer, Tennessee Valley Authority. (Technology)

DONOVAN, HENRY A., (1941). Special Assistant to the Assistant Administrator for Management, Agricultural Research Service, USDA. (Office Techniques)

DORN, HAROLD F., (1948). Ph.D., Wisconsin. Chief, Biometrics Branch, Division of Research Services, National Institutes of Health, Department of Health, Education, and Welfare. (Mathematics and Statistics)

DOSTER, JERRY C., (1952). B.A., Davidson. Deputy Director, Personnel, U. S. Information Agency. (Public Administration)

DOWELL, SIDNEY C., (1956). Captain, United States Marine Corps; Freight Transportation Officer. (Social Sciences)

DRAHEIM, E. R., (1945). Ph.D., Cornell. Administrative Officer, Office of Personnel, USDA. Taught at Minnesota, Cornell, and South Dakota State. (Committee on Correspondence Study and Extension Education)

DREIS, THELMA A., (1952). Ph.D., American. Nutrition Programs Service, Agricultural Research Service, USDA. (Social Sciences)

EDELSON, HOWARD, (1952). M.A., Ohio State. Statistician, Food and Drug Administration, Department of Health, Education and Welfare. Taught at Ohio State. (Mathematics and Statistics)

EDSALL, GEOFFREY, (1956). M.D., Harvard. Director, Communicable Disease Division, Walter Reed Army Institute for Research. Taught at Boston. (Biological Sciences)

EDWARDS, GENIANA R., (1950). M.A., George Washington. Information and Editorial Specialist, Foreign Agricultural Service, USDA. (Languages and Literature)

ELLER, JEROME N., (1953). B.A., St. John's. Administrative Assistant to Representative Marshall of Minnesota, U. S. House of Representatives. (Public Administration)

ELLINGHAUSEN, HERMAN C., (1955). Ph.D., Maryland. Research Bacteriologist, Animal Disease Station, Agricultural Research Service, USDA. Taught at Maryland. (Biological Sciences; NIH)

ELLIS, N. R., (1952). M.S., Wisconsin. Chief, Animal and Poultry Husbandry Research Branch, Agricultural Research Service, USDA. (Biological Sciences; Agricultural Research Center Committee)

EMERY, WALTER B., (1945). Ph.D., Wisconsin. General Consultant, Joint Council on Educational Television. Taught at Oklahoma, Wisconsin and Ohio State. (Languages and Literature)

ENGBERG, RUSSELL C., (1946). Ph.D., Columbia. Chief, Research and Information Division, Farm Credit Administration. Taught at Iowa State, Minnesota, and Idaho. (Social Sciences)

ERHARDT, F. L., (1955). M.A. American. Assistant Chief of Publications, Office of Information, USDA. Taught at North Dakota. (Languages and Literature)

ESTEN, RANDALL D., (1950). M.S., Syracuse. Chief, Map Compilation Techniques Section, Engineer Research and Development Laboratory, Department of the Army. Taught at Syracuse. (Mathematics and Statistics)

ETIENNE, MARGUERITE, (1951). B.A., Rennes. Teacher, Ursuline Academy. (Languages and Literature)

EVERETT, GEORGE H., (1946). C.E., Clarkson College of Technology. Cartographic Engineer, U. S. Coast and Geodetic Survey, Department of Commerce. Taught at American Institute, Bolivia. (Technology)

EYSENBURG, MAURICE H., (1956). Art Institute of Chicago. Illustrator, Department of State. Taught at Chicago and Abbott Art School. Technology)

FARLAND, ROBERT, (1956). E.E., University of New Hampshire; M.A., Massachusetts Institute of Technology. Oceanographer, Hydrographic Office, Department of the Navy. (Physical Sciences)

FELDMAN, DENNIS S., (1956). B.A., New York. Chief, Pamphlets Section, International Press Service, United States Information Agency. (Languages and Literature)

FIELDS, WALTER S., (1955). B.S., Michigan State. Plant Pathologist, Plant Quarantine Branch, Agricultural Research Service, USDA. (Biological Sciences)

FINDLAY, JOSEPH P., (1947). A.B., George Washington. Chief, Division of Classification, Office of Personnel, USDA. (Public Administration)

FINLAY, S. BERNARD, (1955). Graduate, Instituto Massimo (Rome); B.A., Georgetown; Diploma, Sorbonne. Foreign Broadcast Monitor and Interpreter. Taught in Italy, France, and Washington, D. C. (Languages and Literature)

FITE, GEORGE L., (1954). M.D., Harvard. Pathologist, National Institute of Arthritis and Metabolic Diseases, National Institutes of Health, Department of Health, Education, and Welfare. (NIH)

FITZPATRICK, RICHARD S., (1947). M.A., American. Editorial Advisor to the Chief, Intelligence Production Division, Office of Research and Intelligence, U. S. Information Agency. Taught at American. (Social Sciences)

FLANNERY, JOSEPH, (1956). B.A., George Washington. Director, Division of Management Operations, Federal Extension Service, USDA. (Social Sciences)

FLAVIN, THOMAS J., (1946). LL.B., Georgetown. Judicial Officer, Office of the Secretary, USDA. Taught at Georgetown. (Public Administration)

FLETCHER, HEWITT G., (1954). Ph.D., Massachusetts Institute of Technology. Chief, Section on Carbohydrates, National Institute of Arthritis and Metabolic Diseases, National Institutes of Health, Department of Health, Education, and Welfare. (NIH)

FLORY, EVAN L., (1954). Ph.D., Nebraska. Chief, Branch of Land Operations, Bureau of Indian Affairs, Department of the Interior. (Technology)

FONDREN, JAMES P., (1954). B.S.C.E., Arkansas. Cartographer, Soil Conservation Service, USDA. (Technology)

FONFARA, EDWARD W., (1950). Cartographic Engineer, Hydrographic Office, Department of the Navy. (Technology)

FOOTE, RICHARD J., (1940). M.S., Iowa State. Head, Price and Trade Research Section, Statistical and Historical Research Branch, Agricultural Marketing Service, USDA. (Mathematics and Statistics; Social Sciences)

FORBES, JAMES D., (1950). LL.B., Southeastern. Attorney Advisor, Office of General Counsel, USDA. (Correspondence)

FORSYTHE, WILLIAM J., (1950). Chief, Photographic Services Section, Office of Information, USDA. (Technology)

FOSTER, WILLIAM A., (1955). M.S., University of the State of New York. Special Assistant for Instrumentation and Instruction, Hydrographic Office, Department of the Navy. (Technology)

FRENCH, PATTERSON, (1949). Ph.D., Columbia. Technical Assistance Officer, International Bank for Reconstruction and Development. (Public Administration)

FRETTS, CARL A., (1946). C.P.A.; B.S., Pittsburgh. Acting Manager, Federal Crop Insurance Corporation, USDA. Taught at Pittsburgh. (Committee on Internal Audit)

FRIED, MAURICE, (1953). Ph.D., Purdue. Soil Scientist, Agricultural Research Service, USDA. Taught at Purdue. (Languages and Literature)

FRIEDMAN, S. J., (1955). B.S., George Washington. Chief, Photogrammetry Section, Engineer Research and Development Laboratory, Department of the Army. (Technology)

FRIEDMAN, WILLIAM, (1956). B.S., Queens. Plant Quarantine Inspector, Agricultural Research Service, USDA. (Biological Sciences)

Fritz, Sigmund, (1953). D.Sc., Massachusetts Institute of Technology. Meteorologist, Weather Bureau, Department of Commerce. Taught at National. (Physical Sciences)
Fuchs, Robert H., (1949). A.B., American. Accountant. (Office Techniques; Public Administration)

Gaasterland, Kathrine Wilkey, (1948). M.A., Columbia. Administrative Assistant, United States Information Agency. Taught at Chattanooga Public Schools and State Teachers College (Indiana, Pa.). (Office Techniques)
Gale, Esson M., (1955). Litt. Ph.D., Leyden. Administrator and Scholar, Far Eastern Affairs. Taught at Michigan, California, Virginia, George Washington, and Northwestern. (Social Sciences)
Gallup, Gladys G., (1946). Ed.D., George Washington. Director, Division of Extension Research and Training, Federal Extension Service, USDA. Taught at Louisiana, Tennessee, North Carolina, Virginia, Maryland, Florida, Colorado A. and M., Oregon State, and Washington State. (Committee on Internship Cooperation)
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Gass, Saul I., (1954). M.A., Boston University. Applied Science Representative, International Business Machines Corporation. (Mathematics and Statistics)
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Gehring, J. H., (1949). C.E., Rutgers. Manager, Ordnance Facilities Branch, Bureau of Yards and Docks, Department of the Navy. (Technology)
George, Catherine F., (1956). B.A., Maine. Publications Editor, Publications Division, Office of Information, USDA. (Languages and Literature)
Gerretson, Fred W., (1954). Ph.B., Wisconsin. Government Representative for Photo Products Departments, E. I. du Pont de Nemours and Company. (Technology)
Gill, William A., (1950). The William Gill Company, Management Consultants. (Public Administration)
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Glover, Earl R., (1951). M.S., Texas A. and M. Assistant to Deputy Administrator, Marketing Research and Statistics, Agricultural Marketing Service, USDA. (Committee on Internship Cooperation)
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Grant, Charles L., (1943). Deputy Director, Office of Budget and Finance, USDA. (Public Administration)
Grant, Robert, (1954). LL.B., Catholic. Executive Officer, National Heart Institute, National Institutes of Health, Department of Health, Education, and Welfare. (NIH)
Gray, Thomas I., Jr., (1949). B.S., Arkansas State. Meteorologist, Weather Bureau, Department of Commerce. Taught at Arkansas State. (Physical Sciences)
Greenhouse, Samuel W., (1954). M.A., George Washington. Mathematical Statistician, National Cancer Institute, National Institutes of Health, Department of Health, Education, and Welfare. (Mathematics and Statistics)
Greenly, B. Colin, (1955). A.B., Harvard. Director of Art, Madeira School for Girls. Taught at Potomac School and Landon School for Boys. (Technology)
Guidry, Nelson P., (1947). Geographer, Foreign Agricultural Service, USDA. (Mathematics and Statistics)

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Hainsworth, R. G., (1938). M.A., American. Principal Economic Geographer, Foreign Agricultural Service, USDA. (Mathematics and Statistics; Technology)
Hall, David G., (1954). M.S., Kansas State. Chief, Publications Branch, Information Division, Agricultural Research Service, USDA. Taught at Arkansas. (Committee on Information)
Hall, Forest J., (1955). B.Litt., Notre Dame. Information Specialist, Agricultural Marketing Service, USDA. (Committee on Publications)
Hall, H. Duncan, (1947). B.Litt., Oxford; M.A., Sydney. Formerly Historical Advisor, British Embassy Former League of Nations Official. Taught at Harvard, Sydney, and Syracuse. (Social Sciences)
Hall, Robert T., (1948). M.S., Oregon, Chief, Editorial Section, Information and Education Division, Forest Service, USDA. (Committee on Publications)
Halsman, Julius, (1955). Chief, Photography Division, Armed Forces Institute of Pathology. (Technology)
Hamm, Joseph F., (1954). B.C.S., Columbus. Head, Lithographic Section, Soil Conservation Service, USDA. (Technology)
Hansen, Morris H., (1939). M.A., American. Assistant Director for Statistical Standards, Bureau of the Census, Department of Commerce. Taught at American. (Mathematics and Statistics)
Harding, Edward W., (1950). M.S., Syracuse. Assistant Dean, School of Management, Foreign Service Institute, Department of State. (Public Administration)
Harman, Susan E., (1937). Ph.D., Johns Hopkins. Professor of English, University of Maryland. Taught at Nebraska State Teachers College (Peru). (Languages and Literature)
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HENDRICKS, WALTER A., (1947). M.A., George Washington. Chief, Research and Development Staff, Agricultural Estimates Division, Agricultural Marketing Service, USDA. Taught at North Carolina State. (Mathematics and Statistics)

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HIGGINSON, W. S., (1946). M.A., Utah. Chief, Multiplex Unit, Photogrammetric Section, U. S. Geological Survey, Department of the Interior. Taught at George Washington. (Technology)

HILBERT, G. E., (1950). Ph.D., Yale. Director of Utilization Research, Agricultural Research Service, USDA. (Public Administration)

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HUBBARD, HENRY F., (1955). Ph.D., George Washington. Personnel Officer, Department of General Administration, District of Columbia Government. Taught at George Washington. (Public Administration)

HUBERT, LESTER F., (1955). M.S., Chicago. Meteorologist, Weather Bureau, Department of Commerce. (Physical Sciences)

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LEIFSON, GUNNAR, (1952). M.S., Washington. Head, Survey Branch, Hydrographic Office, Department of the Navy. (Technology)

LEVY, JOSEPH B., (1952). Ph.D., Harvard. Senior Research Associate, Naval Ordnance Laboratory, Department of the Navy. (Physical Sciences)

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LOFTUS, JOSEPH P., (1946). A.B., St. Mary's College. Chief, Fiscal Management, Office of Budget and Finance, USDA. (Public Administration)

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Maxwell, Robert W., (1946). M.A., Nebraska. Commissioner of Accounts, Bureau of Accounts, Department of the Treasury. (Public Administration)
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McClarren, J. Kendall, (1946). Assistant Director, Office of Information, USDA. (Languages and Literature)
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McCullough, Norman B., (1954). Ph.D., M.D., Chicago. Chief, Laboratory of Clinical Investigation, National Microbiological Institute, National Institutes of Health, Department of Health, Education, and Welfare. Taught at Michigan State, Chicago, Detroit Institute of Technology, and Georgetown. (NIH)
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Mercready, Robert B., (1955). B.S., Rutgers. Cartographer, Aeronautical Chart and Information Center, Department of the Air Force. Taught at Maryland. (Technology)
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Mileham, Harry P., (1947). M.A., Columbia. Chief of Publications, Office of Information, USDA. (Languages and Literature; Committee on Publications)
Miller, Lowell E., (1951). J.D., State University of Iowa. Attorney, Office of General Counsel, USDA. (Correspondence)
Miller, Martin H., (1955). M.A., Western Reserve. National Sales Representative, Savings Bonds Division, Department of the Treasury. Grand Prize Winner, 1954, National Newspaper Snapshot Contest. Winner, John R. Hogan trophy, Photographic Society of America, 1955. (Technology)
Minor, William A., (1946). B.S.A., Georgia. Assistant Administrator for Management, Foreign Agricultural Service, USDA. (Public Administration)
Mohagen, Verna C., (1942). M.A., George Washington. Director, Personnel Management Division, Soil Conservation Service, USDA. (Office Techniques)
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Moore, William L., (1948). A.B., Antioch. Chief, Personnel Division, Farm Credit Administration. (Office Techniques)
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Murr, Carl, (1955). Vocational Rehabilitation Officer, Medical Division, U. S. Civil Service Commission. (Languages and Literature)
Myers, Charles T., Jr., (1955). Chief, Division of Photography, Office of Information, USDA. (Technology)

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NEWELL, STERLING R., (1929). M.A., American. Director, Agricultural Estimates Division, Agricultural Marketing Service, and Chairman, Crop Reporting Board, USDA. (Mathematics and Statistics)
NICHOLS, A. J., (1956). D.P.A., Harvard. Assistant Director, Foreign Training Division, Foreign Agricultural Service, USDA. (Public Administration)
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